January 1931 Reg. No. 1155

Vol. XIX No. 1

The Madras Agricultural Journal

E. 7683.

Published by
THE M. A. S. UNION
Agricultural College and Research Institute
Coimbatore, S. India.

Annual Subscription Inland Rs. 4-0
,, ,, Foreign ,, 4-8

Single Copy
As. 6

The Madras Agricultural Students' Union

PATRONS

V. Arumugam Pillai, Sundaikamathur, Coimbatore District.

Dewan Bahadur C. Arunachala Mudaliar, Zamindar of Chunampet, Chingleput District.

Lodd Govindoss, Madras.

Khan Bahadur Haji Abdulla Haji Kasim Sahib Bahadur, Udipi, S. Kanara District.

A. M. Kalinga Rayar, Kumara Zamindar of Uttukuli, Coimbatore District.

Raja Sree Krishnachandra Gajapati Narayan Deo Garu, Raja of Parlakimidi, Ganjam District.

Raja Sri Madana Mohana Simha Deo Garu, Zamindar of Dharakota.

V. Madhava Rajah, Kollengode, Malabar District.

Rao Bahadur Sir A. P. Patro, Berhampore.

Rao Bahadur T. A. Ramalingam Chettiar, Coimbatore.

Sir C. P. Ramaswami Ayyar, Madras.

Rao Bahadur C. S. Rathnasabapathy Mudaliar, Coimbatore.

M. Sambandam Mudaliar, Coimbatore.

Veerarayan Thirumalpad, Nilambur, Malabar District.

V. C. Vellingiri Gounder, Coimbatore.

Venganad Raja Sir Vasudeva Rajah, Kollengode, Malabar District.

C. V. Venkataramana Ayyangar, Parlakimidi.

R. Jeevandas, Varanasi, Parlakimidi.

The Madras Agricultural Students' Union

OFFICE-BEARERS FOR 1930–31

The Council (15)

1. R. C. Broadfoot, President (*Ex-officio*).
2. Rao Bahadur T. S. Venkataraman, *Resident Vice-President*.
3. Rao Bahadur D. Ananda Rao, *Moffusil Vice-President*.
4. K. T. Alwa.
5. C. Ramaswami.
6. K. M. Thomas, *Secretary*.
7. Rao Bahadur B. Viswa Nath, *Editor*.
8. G. N. Rangaswami Ayyangar.
9. V. Muttuswami Ayyar.
10. M. C. Cherian.
11. Rao Bahadur J. Chelvaranga Raju.
12. G. Jogi Raju.
13. U. Vittal Rao.
14. K. T. Bhandari.
15. A. S. Swaminathan, *Student, Class II*.

Managing Committee (9)

1. President.
2. Resident Vice-President.
3. Secretary.
4. Editor.
5. S. V. Duraiswami Ayyar, *Manager*.
6. M. Rajagopala Ayyar, *Treasurer*.
7. K. Krishnamurthi Rao.
8. M. A. Sankara Ayyar.
9. S. Krishnamoorthy Rao, *Student Class II*.

Editorial Board (7)

1. Editor.
2. Secretary.
3. Manager.
4. Rao Sahib Y. Ramachandra Rao.
5. M. R. Balakrishnan.
6. C. S. Krishnaswami.
7. M. J. David, *Student*, *Class III*.

E. 7683

YOUR

FLOWERS
VEGETABLES
FRUIT TREES

will benefit from applications of

PARRY'S
Garden Fertilisers

Stocks in economical packings at the Agri-Horticultural Society's Nursery Garden, Madras.

FOR

EVERY
FIELD CROP

There is a Complete

PARRY'S STANDARD FERTILISER

Stocks at Ranipet and Feroke Factories and at Depots throughout South India.

Prices and Particulars from :

PARRY & CO., LTD.
Ryot Sales Dept.
Box No. 12, MADRAS

STANES

THE LEADING FERTILISER FIRM

WE KNOW WHAT MANURES ARE REQUIRED BY THE RYOT AND WE SUPPLY THEM AT THE CHEAPEST PRICES COMPATIBLE WITH VALUE

STANES X. L. ALL

PADDY, COCONUT, POTATOES TOBACCO AND CHILLIES MANURES ARE UNBEATABLE FOR *QUALITY*, MECHANICAL CONDITION AND EFFICACY.

BUY. THE BEST

From:—

T. STANES & CO. LTD.,

FERTILISER SPECIALISTS,

COIMBATORE.

SURVEY OF INDIA MAPS

FOR ALL PURPOSES

Maps are available from recent surveys, fully coloured, showing all the Planting Districts on scales 1″ and ½″ to a mile.

Also smaller scale maps :—4 miles to the inch and 16 miles to the inch. Unmounted or in book-form or for the wall.

MAPS AND PLANS REPRODUCED. ALL KINDS OF MAP MOUNTING DONE SURVEYS OF ESTATES UNDERTAKEN. SPECIAL MAPS.

Bangalore and Surrounding Country	1″ = 1m. ...	Rs. 2 0	
Bangalore Guide Map ...	3″ = 1m. ...	„ 3 8	
Seringapatam Guide Map ...	3″ = 1m. ...	„ 2 0	
Ajanta, Ellora Cave Guide Maps	... ...	„ 1 0	each.
Guide Map to Hampi Ruins ...	... ...	„ 1 0	
Guide Map to Pachmarhi ...	1″ = 1m. ...	„ 2 0	
Railway Map of India ...	... ...	„ 1 10	
Road Map of India ...	1″ = 50m. ...	„ 1 4	

Map Catalogue Rs. 1-8-0 including postage.

Apply to :—

THE DIRECTOR, SOUTHERN CIRCLE,

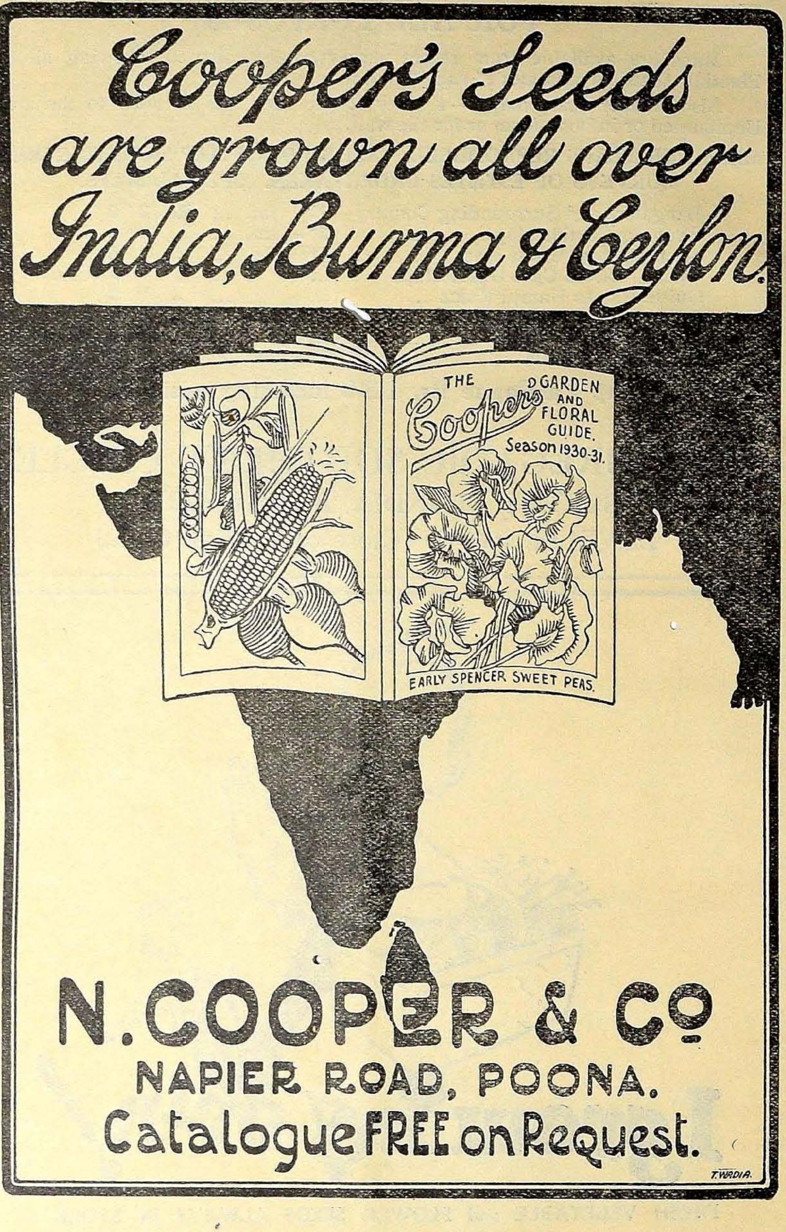
SURVEY OF INDIA, BANGALORE.

LAVELLE ROAD (Close to B. U. S. Club.)

FRESH VEGETABLE and FLOWER SEEDS ALWAYS IN STOCK

Ask for free catalogue with illustrations

PESTONJI P. POCHA & SONS, Post Box 55, Poona


Cooper's Seeds
are grown all over
India, Burma & Ceylon.
THE Coopers GARDEN AND FLORAL GUIDE.
Season 1930-31.
EARLY SPENCER SWEET PEAS.
N. COOPER & Co
NAPIER ROAD, POONA.
Catalogue FREE on Request.
T. WADIA.

CONTENTS

PAGE

NEW YEAR GREETINGS 1

ORIGINAL ARTICLES—

I. A Review of Some Breeding Experiments carried out at the U. P. Poultry Association's Demonstration Farm, Lucknow—*By A. K. Fawkes* 2

II. The Place of Paddy in the Welfare of the Country—*By G. R. Hilson* 6

III. The Cost of Production of Cotton at Koilpatti—*By V. Ramanathan* 10

IV. The Prickly-pear Cochineal—Its utilization for destroying Cactus in South India—*By Rao Sahib Y. Ramachandra Rao* 14

V. A Practical Method of Estimating Disease Resistance in Crop Plants—*By K. M. Thomas* 16

VI. A Short Note on the Pomegranate and its Cultivation in Somanur (Coimbatore District)—*By P. S. Suryanarayana Ayyar* 24

VII. The Sunshine Recorder and some interesting Weather Data—*By B. S. Narasimhan* 30

VIII. A New Paddy Disease in Madras—*By K. M. Thomas* ... 34

IX. Youth and Rural Uplift—*By M. J. David* 37

X. The Madras Agricultural Students' Union and its *Journal*—*By Rao Bahadur M. R. Ramaswami Sivan* 39

XI. Farming Calendar for January and February 42

SELECTED ARTICLES—

Care of the Dairy Cow or Buffalo at Calving Time 44

NOTES AND COMMENTS 47

GLEANINGS 50

CORRESPONDENCE 52

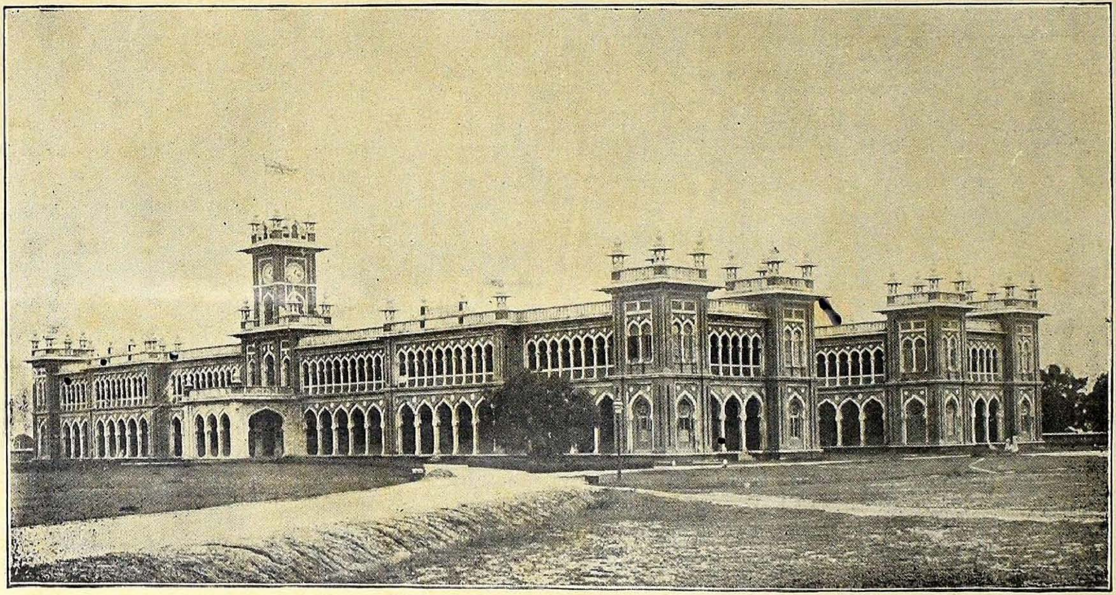
NOTES ON BOOKS RECEIVED IN THE LIBRARY 56

COLLEGE NEWS AND NOTES 57

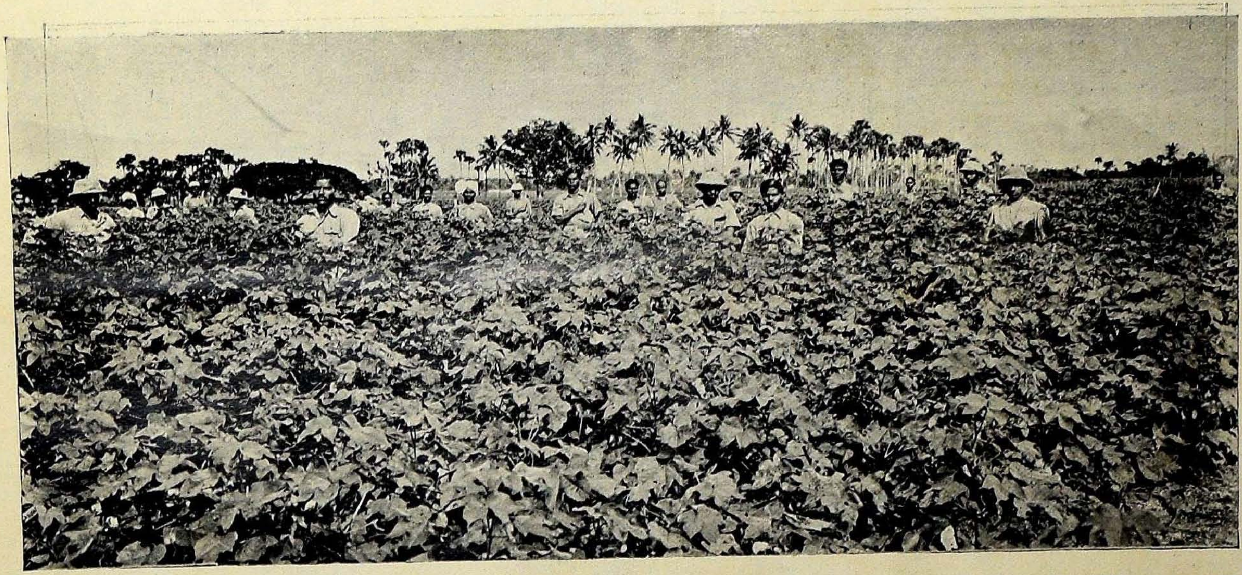
OBITUARY NOTICE 59

DEPARTMENTAL NOTIFICATIONS 60

APPENDIX—Additions to the Library 62



AGRICULTURAL RESEARCH INSTITUTE. COIMBATORE



STUDENTS OF THE AGRICULTURAL COLLEGE IN THEIR CULTIVATION PLOTS

> **Farming will never be a success unless the farmer had more voice in the disposal of his produce—P. Morrel.**

The Madras Agricultural Journal

(ORGAN OF THE M. A. S. UNION)

Vol. XIX] JANUARY 1931 [No. 1

NEW YEAR GREETINGS

Good bye 1930! Welcome 1931! To the members of our Union, to our contributors, printers, advertisers, readers and to all those ladies and gentlemen who extended to us their sympathy and support we offer our greetings and wish them a happy and prosperous New Year.

Standing at the threshold of the New Year with new born hopes, we feel reluctant to look back into the singularly unfortunate year that has just past. We must confess ourselves to a feeling that we should like to forget it. But we are unable to do so. As the events of the past year pass in review, we are overwhelmed with feelings of sorrow for the all-round misery and suffering by the rich and the poor alike. The political situation, the strikes, the cyclones, the floods and above all the general slump in the markets of the world have combined to rob the innocent and peaceful peasant farmer of the fruits of his honest toil.

In looking at the past in dismay, we will only be losing sight of the real present and the hopeful future. We will not despair because the hill of life is so steep. We must not forget that the panorama from the top is glorious.

The wise have said that every dark cloud has its silver lining. We see already the truth of it. We hope that the labours of the Imperial Conference that had only recently concluded its sittings

broody at intervals for a few days only and then return to lay has been the factor that has marred their otherwise fine performance. This propensity is only a matter of experiment to breed out. The interesting fact is, that this untried unpedigreed breed from India has put up in Europe, a very fine record, especially hens numbered 457 and 461. The former, by one egg only, failed to get the copper ring award, the hall mark of a recognized high producer.

In the field, that is to say in our distribution of eggs and birds to U. P. villages, the Busra X Leghorn cross has given satisfaction, and we are getting a great demand for all the stock that we can produce.

We hope to continue to breed these birds and would recommend all poultry breeding centres to indent on us for eggs and so procure a large supply of these fowls making them available to the smaller poultry breeders throughout India. Concerted action ought to be taken to raise large supplies of such a useful variety.

Note.—We have been placing pure Basra and first crosses between Busra hens and white Leghorn cocks into our villages with excellent results We have not yet distributed other crosses as they are still in the experimental stage of testing. Eggs of second crosses will go out to villages this year for hatching purposes.

TABLE I.

Record of 7 Busra hens sent to the National Egg Laying Test, England.

(The Test record is for 336 days of 12 lunar months, i. e. 48 weeks.)

Serial No.	Regd. No. of hen	Total eggs laid	1st grade	2nd grade
1	456	143	77	66
2	457	173	124	49
3	458	157	34	123
4	459	78	1	77
5	460	141	104	37
6	461	179	170	9
7	462	169	97	72

The average egg production per hen is 148·4.

TABLE II.

Four years winter record of Pure Busra hens

Year	Number of hens in pen	Eggs laid per month				Total	Average per bird	Remarks
		Nov.	Dec.	Jan.	Feb.			
1926–7	4	—	60	89	80	229	57·1	
1927–8	4	27	61	59	76	223	55·3	One hen was accidentally killed during 1928.
1928–9	3	52	33	54	24	163	54·1	
1929–30	3	9	24	16	44	98	32·2	The hens are now 5 years old and still laying.

TABLE III.

Three years winter record of FIRST CROSS

(½ bred Leghorn. Busra × White Leghorn cock)

Year	Number of hens in pen	Eggs laid per month				Total	Average per bird	Remarks
		Nov.	Dec.	Jan.	Feb.			
1927–8	7	85	151	156	137	529	75·4	
1928–9	9	151	136	146	141	574	63·7	
1929–30	8	60	126	130	120	436	54·4	One death

TABLE IV.

Two years winter record of SECOND CROSS

(¾ bred Leghorn Busra. Busra × White Leghorn male mated to a white Leghorn male)

Year	Number of hens in pen	Eggs laid per month				Total	Average per bird	Remarks
		Nov.	Dec.	Jan.	Feb.			
1928–9	14	227	252	...	...	479	68·6	The hens were sent to a village and their records lost to the farm. (The average is calculated on a 2 months' basis.)
1929–30	5	65	78	75	65	283	56·3	

TABLE V.

Four months winter record of THIRD CROSS

(⅞ bred Leghorn Busra. Female progeny from mating Busra × White Leghorn × White Leghorn to a White Leghorn male)

Year	Number of hens in pen	Eggs laid per month				Total	Average per bird	Remarks
		Nov.	Dec.	Jan.	Feb.			
1929–30	8	89	152	160	151	552	69	

TABLE VI.

One year laying record of FIRST CROSS *at the U.P.P.A. egg laying test*

(From 1st November 1927 to 30th September 1928 *i.e.* 12 lunar months).

Register number of hen.	Number of eggs laid per month											Total	Grade of egg		Remarks
	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.		I	II	
Hen. 44	6	17	24	22	21	14	6	12	8	11	9	150	45	105	
,, 45	9	24	25	22	25	12	3	13	17	3	9	162	47	115	
,, 46	17	25	23	20	18	17	6	6	13	13	5	163	39	124	
,, 47	14	25	23	21	22	16	10	12	18	8	14	183	64	119	
,, 48	19	23	23	20	21	19	5	13	17	13	7	180	55	125	
,, 49	6	17	17	15	17	9	6	5	16	6	5	119	35	64	
,, 50	14	20	21	18	22	11	9	9	10	5	Nil	139	28	111	

THE PLACE OF PADDY IN THE WELFARE OF THE COUNTRY[1]

By G. R. HILSON, B.Sc.

Director of Agriculture, Government of Madras

I understand that you are interested not only in the dry parts of economics but also in the effect on the community at large, of maladjustments in the economic position. I have therefore chosen as the subject of my discourse what I consider to be a grave maladjustment in the agricultural economy of this Presidency. I refer to the large area under paddy, more particularly swamp paddy.

The total area actually under crop, in the Presidency, is approximately thirty-nine million acres. The total area under paddy is approximately, eleven million acres, of which area approximately eight millions are swamp paddy. This does not mean that every third or fourth crop is a paddy crop and that other crops are given in rotation with it. If that were so, much of what I have to say would not need to be said. As you are aware, there are wide stretches of country where paddy follows paddy monotonously every year and these stretches are getting wider and the area under swamp paddy is being added to yearly. This is the position. I propose to examine

[1]Lecture delivered at the Senate House, on Wednesday, October 5, under the auspices of the Madras Economic Association. Published by Courtesy of the Editor, *Madras University Journal.*

it from the swamp paddy aspect first and then view the paddy position as a whole. I am following this order because, whatever the paddy position generally, the aspect of the swamp paddy position which I propose to lay before you, will remain the same.

The salient feature of swamp paddy cultivation is that the land is by preference kept under a slowly moving stream of water three or four inches in depth. This procedure is attended by many disadvantages.

The first is that enormous quantities of water are used in growing the swamp paddy crop, much more than is necessary for growing any other crop which requires irrigation only occasionally. The main effect of this is that for a given supply of water under given conditions, the area which can be protected from failure of season is less when swamp paddy is given than otherwise would be the case. The cultivators who insist on growing swamp paddy determine the shape that an irrigation project shall take and the limits of the area which shall be benefited. In a country like this where failure of crop for climatic reasons is comparatively frequent, it is obviously better that as large an area as possible should be protected against drought.

The second disadvantage is worse than the first. While the paddy crop is on the ground, it prevents or inhibits the growing of crops other than paddy. The first result of this is that the majority of the cultivators have to depend on paddy and paddy alone. This is particularly the case when it is possible to grow more than one paddy crop in the year. The evil of a one-crop rotation is therefore established. The second result is that it places a very definite check on enterprise. Anybody can grow swamp paddy and the opportunities for exercise of skill are very limited. The third result is that it ends in a loss of all knowledge of how to grow other crops so that when that knowledge is needed, as at present, the cultivator does not know what to do and is unable to react to change of conditions as quickly as he should.

The third disadvantage is that while the crop is on the ground, there is no room for the cattle of the village. They have therefore usually to be sent away long distances to a forest to graze. As they go they collect and spread diseases of which many of them die. The forest is usually overstocked, with the result that the cattle lose such condition as they had and at the same time lose some of their resistance to disease. There is therefore an enormous wastage annually and the cattle are the poorest of their kind. This state of affairs leads to a practice which causes a further aggravation of the position. Cattle treated like this cannot produce milk in any quantity. It is hopeless to try. The buffalo is therefore introduced as a milk producer and that puts the final closure on any idea of improving the cattle so that they will produce a reasonable supply of milk and a good calf. On the need for a greater all-round consumption of pure cows' milk there is much to be said, but that is a subject in itself. Before leaving this item it has to be mentioned that this practice of grazing cattle in the forest in this way, besides being bad for the cattle, is bad for the forest.

The fourth disadvantage is that the swamp paddy crop demands the application to the land of large quantities of unrotted organic matter. If these cannot be obtained from waste land or by growing a green manure crop, then the forest has again to be drawn upon, to the detriment of the forest.

The fifth is that between planting and harvest, the paddy crop requires very little attention and as, there are no other crops to provide occupation

between times, there is an unequal demand for labour. Short spells of activity are followed by long spells of idleness. One result is that gangs of labourers wander round the country in the busy seasons following the work. They are at times a distinct menace to public health.

The sixth is that the paddy crop provides little in the way of subsidiary industry which will afford employment for the population in excess of that required for the cultivation of the land. This is not strictly a disadvantage peculiar to swamp paddy but this is the most convenient place at which to mention it. The point I wish to make is that when the population in an area is in excess of requirements for the cultivation of the land and the subsidiary industries dependent on cultivation, the surplus must migrate, emigrate or compete for a share of the labour requirements of the land and the subsidiary industries. Paddy affords little scope for the establishment of subsidiary industries.

There is a further disadvantage of swamp paddy cultivation, dependent on the fact that such large quantities of water are used in its cultivation, to which reference must be made. In order to avoid the trouble of many to lift so much water, the level of the fields has been lowered so as to permit the water to flow on to the fields. This has resulted in the high ground of the village being passed away until there is very little left except that on which the houses and a few topes stand. The paddy fields come right up the doors of the houses in some cases. The few cattle that are kept in the village have only a restricted space to move in, and sanitary arrangements frequently leave much to be desired. Pools of water lie about the fence and mosquitoes and other insects are prominent. Altogether during the monsoon a paddy village is not the pleasantest of places to live in.

I have indicated the more direct and some of the consequential disadvantages of the swamp method of cultivating paddy. What about its advantages? It is supposed to have two. One is that by this means large quantities of food are produced on the spot and the other is that this crop can be grown where natural conditions would forbid any other crop being grown. The latter advantage remains and to my mind should be the only excuse for growing paddy under swamp conditions. The former advantage has lost most of its point now that food can be so easily moved by road and railway to whatever point where there is scarcity and it should not be forgotten that a grain of paddy is one-third husk which is not fit for human consumption, while with ragi the proportion of husk to grain is one-twentieth. The first advantage can now be ruled out. Times have changed and continue to change. The agricultural labourer in the future will expect more of the good things of life which he sees others enjoying, and will demand higher wages, which the paddy crop will not be able to provide. The farmer himself wants a better return on his money than he can get by growing paddy. Paddy will have to concede some area to other crops. It is already doing so, but slowly.

And now we will turn to the general paddy position. Last year I worked out the statistical position, and on a basis of a population of 46 millions, with 40 per cent of the population rice-eaters, an average consumption of rice per head of 4 cwts. per annum, a yield of rice per acre of 8 cwts. after allowing for wastage, dryage and reserve for seed and an acreage of 11·3 million acres, I came to the conclusion that the needs of the Presidency

were being met, and suspected that rice was being held up. Against this was the fact that on the average of three years there was a net import by sea of 345,000 tons of rice. Owing to the absence of information as to the movement of rice by road and rail, it is not possible to make an absolutely definite statement, but it is, I think, a fair assumption to make that the paddy and rice imported into the ports of Tuticorin and Cochin are for the use of Travancore. During the three years in question the average import into these two ports was equivalent to 250,000 tons of rice, thus accounting for a very large proportion of the net import.

The position for 1929-30 is more favourable still to the idea that we are able to meet our own needs as the net import for the year is equivalent to only 245,000 tons of rice most of which comes from Burma. The import into Tuticorin and Cochin is equivalent to 220,000 tons of rice, thus leaving a net import of 25,000 tons. It is known that paddy is being stored in the country in the hope of a return to better prices.

Now if we have reached a position like this, where we are as it were balanced on a knife edge, with one year a net import of 100,000 tons and, the next year, a small net export, we shall be wise to take stock of the position and see what the future has in store for us. 100,000 tons of rice spread over 8,000,000 acres is equivalent to an average increase of 50 lbs. of paddy, a mere flea-bite. If all the swamp paddy crops or a large proportion of them were got in early and the season was average, this increase would be easily surpassed. If to this possibility is added the efforts the Agricultural Department is making successfully to reduce the seed-rate, to encourage the spread of the practice of growing green-manure crops for use in conjunction with phosphatic manures and to increase the acreage under heavier yielding strains, it must be admitted that the time is in sight when the normal position will be that there is a considerable net export. Add to this that wheat is coming into favour as a substitute for rice among the educated classes thereby reducing the demand for rice and adding to that a substantial increase in acreage and very soon a good season will land us into the same plight as the jute-growers in Bengal. For the line we are following is the line that all the other paddy-growing countries in the world are following. They are all strong to increase the average yield per acre and the total acreage, especially those countries which do not at present produce enough paddy for their own needs. The outlook for the future does not look very promising for those who are hoping for a rise in prices.

Now look where we are drifting and look at the position we are in as regards other matters. With a properly regulated supply of water to be used to eke out rainfall or as a stand-by, we have ideal conditions for producing sugar, fruit, vegetable oils, fibres, cotton, milk and milk products, eggs and vegetables. Look at this list and look at the things we import and you will arrive at the conclusion that the cultivator of this Presidency would be wiser to try and capture his home market and to produce raw materials which other countries are less favourably placed for providing than to drift into—aim is too definite a word—becoming the importunate seller of rice to an unwilling buyer. If, further, it is remembered that some of the articles on this list form the raw materials of industries which already exist and could expand or of industries which could be established and which would provide more employment for the people of the country than is the case with paddy then this conclusion is the more inevitable.

COST OF PRODUCTION OF COTTON AT THE GOVERNMENT FARM, KOILPATTI

By V. RAMANATHAN, L. Ag,

Cotton Specialist.

The economics of crop growing is always a subject of great importance to all farmers since the prime object of farming is, as in other industries, to obtain profits. This term expresses the relationship between expenditure and income. The former is greatly influenced, especially in India, by the wages paid to the labour engaged, while the latter is mostly dependent on the prices obtained for the agricultural produce. If the prices paid to labour and to the various commodities grown on a farm move in consonance, a constancy in the profits will result. On the contrary such a simple situation rarely occurs. As the problem stands at present, there is a ruinous slump in the markets for all agricultural products and there is no corresponding change in the labour bill and in the standards of living which have risen considerably during the war. This lag has caused great anxiety in the minds of cultivators. The margin of profit has become very narrow. If only they possess an accurate knowledge of the cost of production of each crop they grow, they can face the crisis by cultivating the crops that will pay them to grow without at the same time impoverishing the natural fertility of the land. But every Indian ryot feels shy to keep accounts of his husbandry and is consequently in a fix to decide intelligently how and where to effect a retrenchment. It is thought desirable at this juncture to present the data relating to cotton—the chief money crop on the black soils.

The figures gathered in this note refer to the Karunganni cottons (*G. indicum*) grown on the black soil block of the Agricultural Research Station, Koilpatti, during the period of 12 years from 1914–5 to 1926–7 excluding those of 1915–6, when the records were not complete. The data are remarkable in that they relate to a block of land where cropping was done in a religiously systematic fashion. A four year rotation of cumbu, cotton, fodder cholam and cotton, was practised during the entire period. The several cultural operations were also regular and uniform. The fields were ploughed by a light plough like the 'monsoon', except in fodder cholam plots, where the stubbles were buried down with the help of deep ploughs. Cotton was invariably manured by penning sheep at 1,000 head per acre. Cumbu received all the available farmyard manure, while fodder cholams had often dressings of concentrated manures like fish manure or oil cake. Irungu cholam for fodder was the first crop to be sown on the onset of the north-east monsoon at a heavy seed rate of 65 to 80 lbs. per acre. These were soon followed by cumbu and cotton sowings which were done with country drills in lines 18″ apart. Intercultivation with danthi was given as often as was found necessary.

It may be pointed out that the operations detailed above are not generally practised by the ryots. All the fields intended for cotton will be ploughed with a country plough about a half a dozen times. Sheep will be folded on them if the farmers are solvent and if flocks are easily available. The seeds are broadcast and covered with a country plough. Two to three

TABLE I

Year	Area	Labour per Acre																	
		Preparatory cultivation			Sowing			After cultivation			Harvesting: Season			Harvesting: Summer			Average labour per acre		
		Pairs	Men	Women	Pairs	Men	Women	Pairs	Men	Women	Pairs	Men	Women	Pairs	Men	Women	Pairs	Men	Women
1914–15	53·20	6·2	7·2	...	·56	·88	·06	·62	2·0	13·7	...	...	23·2	...	...	18·1	7·35	10·1	55·1
1916–17	51·50	4·6	5·0	2·0	·57	·70	2·60	·99	3·0	5·2	...	...	22·6	...	...	7·5	6·1	8·7	39·8
1917–18	33·80	4·7	5·5	...	·41	·75	1·05	·41	2·9	5·3	...	...	24·6	...	...	11·8	5·5	8·5	42·5
1918–19	51·28	4·5	4·9	·1	·47	·76	1·03	·69	2·0	12·6	...	...	28·8	...	...	14·7	5·7	7·6	57·3
1919–20	51·64	4·6	5·2	...	·47	·76	...	·71	2·7	7·0	...	...	25·1	...	...	11·8	5·7	8·3	43·9
1920–21	53·51	3·7	3·8	...	·62	1·03	...	·83	10·1	·1	...	·1	25·4	...	...	12·2	5·2	16·0	37·7
1921–22	51·64	4·1	4·6	...	·62	1·03	·03	1·28	3·2	3·5	...	...	27·0	...	...	6·6	5·8	8·8	37·2
1922–23	53·51	5·3	6·4	...	·45	·93	...	·58	3·8	9·4	...	·3	21·9	...	·49	12·7	6·3	11·8	44·0
1923–24	51·65	4·5	5·2	...	·65	·97	...	1·38	4·3	7·8	...	·82	31·2	...	·58	8·2	6·5	12·0	47·3
1924–25	47·11	4·1	4·9	·1	·46	·80	...	·82	3·0	9·7	...	2·2	27·7	...	·63	10·2	5·8	11·5	47·7
1925–26	46·17	4·6	4·9	...	·45	·69	...	·68	2·3	8·4	...	·6	21·9	...	·12	7·7	5·7	8·6	38·0
1926–27	39·75	4·9	5·3	·1	·58	1·45	·28	·64	2·0	4·4	...	·2	26·3	...	·39	12·2	6·11	9·2	43·3
Mean	48·73	4·6	5·2	·2	·53	·90	·4	·80	3·48	7·3	...	·4	25·5	...	·18	11·1	6·0	10·09	44·5
S.D. of mean	...	·64	·86	...	·08	·14	...	·16	·77	3·13	...	...	1·65	...	·204	3·32	·57	2·37	6·7

N.B.—Fields where cotton breeding experiments were carried out, were excluded from this test.

hoeings will be given as the crop grows. The kapas are picked on share system, the picker getting from 1/4 to 1/14 of the quantity picked.

For computing the cost of production, the system of expressing the expenditure in units of men, women and pairs of bullocks is adopted in preference to the usual method of noting it in money value, as, the former lends itself for working out the cost at all periods irrespective of the rise or fall in the prices paid to the labour. It may also be observed here that the data having been gleaned from a Government farm will show a higher rate than what actually obtains on a private farm and therefore may be taken to be on the safe side.

Table I gives the average labour expended in the growing of one acre of cotton during the several years. It is remarkable to find that the figures exhibit a fair consistency except during 1920–21. This deviation had to be attributed to the employment of permanent men to do odd jobs in aftercultivation, whenever there was no other suitable agricultural work on hand.

For the conversion of these units of labour into monetary value, the wages paid to the casual coolies around the farm, viz., 7 annas per man and 3 annas per woman were taken. In the case of bullock power, the cost was arrived at, from the cost of feeding the animals on the farm during 1929–30 taking into account the number of pairs worked during the year and the depreciation and interest on the value of animals and the sheds needed to stall them. In Table II the details are furnished.

TABLE II

The charges for working pair per day during 1929–30

	RS	A	P	
Cost of concentrated food for 6 pairs ...	614	13	0	These were calculated at the lowest prices current for the year.
,, of bulky fodder ,, ,, ...	1,031	5	0	
,, shoeing charges and nose ropes, etc.	31	0	0	
Attendance charges ...	144	1	0	
Interest on the cost of animals Rs. 2,100 at 10 per cent. per annum ...	210	0	0	
Depreciation minus appreciation on 6 pairs	170	0	0	
Interest on the cost of cattle shed at Rs. 1,600 at 10 per cent. ...	160	0	0	
	2,361	3	0	
Deduct the cost of 372 cart-loads of manure at 12 annas per cart-load ...	279	0	0	
Balance ...	2,082	3	0	
Number of pairs actually worked during the year	1,152	0	0	
Therefore the actual charges for working a pair per day	1	13	0	

To the labour bill must be added the value of the seed, the charges for penning sheep, assessment of the land, pay of the watchman employed during the picking season, the cost of hiring the implements, and the interest on the sum needed to meet the expenditure on cultivation.

The average cost of raising one acre of Karunganni cotton works out to Rs. 33-8-0 (vide Table III).

TABLE III

	RS	A	P
6 pairs at Rs. 1-13-0 per pair	10	14	0
10 men at Re. 0-7-0 per man	4	7	0
44·5 women at Re. 0-3-0 per woman	8	6	0
12 lbs. of seeds at Rs. 16 per 250 lbs.	0	12	0
Watchmen	0	13	0
(One man on Rs. 10 for 4 months will watch over 50 acres).			
Cost of sheep penning	5	0	0
Assessment	1	8	0
Hire of implements	0	4	0
Interest on the amount necessary to meet the expenditure during the growing period	1	8	0
Total ...	33	8	0

N.B.—The cost of pulling out stalks will be met from their sale.

Incidentally the cost of producing a pound of cotton at Koilpatti may also be arrived at. The average yield of kapas per acre during the 12 years under study was 356·5 lbs. in the season, and 89 lbs. in the summer pickings. Assuming that the value of the summer picking is two-thirds of that of the season, the yield may be taken as 415·83 lbs. or 416 lbs. If the ginning percentage is taken as 31 and if the price of cotton seed per pothi of 250 lbs. and the charges for ginning 500 lbs. of lint are Rs. 7 and 8 respectively, the cost of production of 1 lb. of Karunganni lint is 3·08 annas at the current rates for farm labour and bullock power.

If a farmer is able to arrive at the correct cost of production of each crop on his farm, it will be easy for him to decide the cropping scheme during the years of falling markets. All the areas which definitely yield below the economic margin of cultivation, should be cropped differently. It is during those years these poor lands must be enriched by growing leguminous crops reserving some of the good lands for his money crops. Around the Koilpatti farm, the ryots are in the habit of growing fodder cholam without any manure on the lighter soils, and cumbu on the manured heavier black soils, so that the poor lighter soils are being exhausted continuously. The present condition of the markets will be quite opportune for them to give up cultivating cotton after fodder cholam in favour of suitable green manures or pulses. Cotton growing may with advantage be confined only to the better manured and richer lands.

THE PRICKLY-PEAR COCHINEAL

Its utilization for destroying Cactus in South India

By Rao Sahib Y. RAMACHANDRA RAO, M.A., F.E.S.,

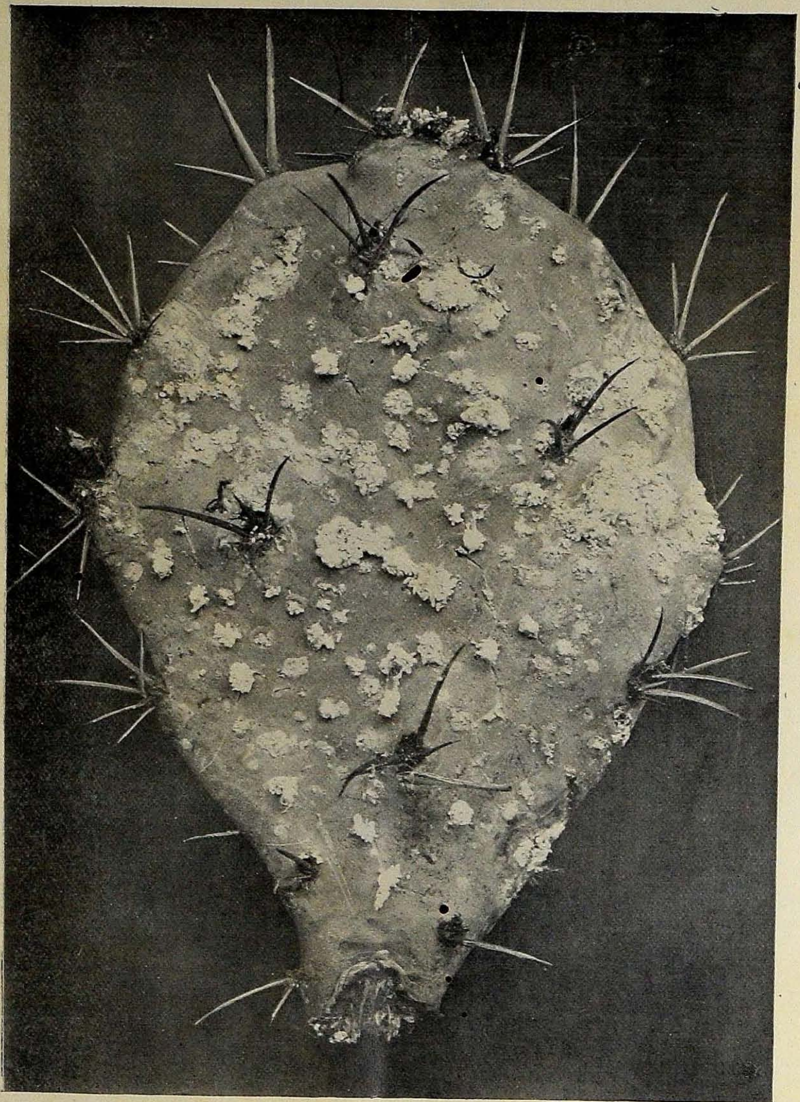
Government Entomologist, Coimbatore.

The Prickly-Pear.—The prickly-pear—the familiar thorny hedge of fields in most parts of our province, is a Mexican cactus introduced about two or three centuries ago into India in an endeavour to cultivate the valuable cochineal insect of commerce. Owing to want of technical knowledge, however, the wrong species of cacti were imported; and the consequence was that the true cochineal insect could not be grown, while the prickly-pear plants could establish themselves and flourish by reason of the ease with which they could take root. The pears have now spread throughout the land, planted, in the first instance, as a live fence in cultivated fields, and later on, escaping into uncultivated land and pastures.

Though serving as a cheap and efficient hedge-plant, experience has shown that, unless periodically cut back, the cactus can become an unmitigated nuisance, especially around village sites, giving shelter to various reptiles and vermin and making the surroundings not only ugly but also insanitary. In a great many places, therefore, in the Madras Presidency there has been a keen demand for cheap and efficient methods for its destruction.

Destruction of cactus in Australia.—In Australia, where the prickly-pear is a far more serious problem, owing to its invasion of vast stretches of virgin land, various methods of destruction have been tried. Of those found efficient, the destruction of cactus by the injection or spraying of arsenical solutions is one, but under South Indian conditions the cost is rather prohibitive; and labour being available, cutting out the pear by hand would probably be cheaper and more efficient. Secondly, various insect pests and diseases found attacking cacti in Mexico and South America have, with due precautions, been introduced into Australia with remarkable success. One of the insects thus introduced is a wild cochineal, *Dactylopius opuntiae* (*tomentosus*) which has been found very effective on two of the pears *Opuntia dillenii* and *Opuntia nigricans*, the two kinds most common in South India.

This cochineal was imported into Ceylon from Australia in 1926–7, and thence it appears to have been conveyed in 1928 by private agency to the environs of Tuticorin in Tinnevelly District. When gradually news as to the efficient manner in which masses of prickly-pear had been killed at Tuticorin spread among the cultivators, they began to carry the insect from village to village, so that at the present time the cochineal is found not only in the various parts of the Tinnevelly District, but also distributed in various centres in the Districts of Ramnad, Madura, Trichinopoly, Tanjore, Salem and Coimbatore. The latest information is that it has also been conveyed to parts of Northern Circars and Ceded Districts.



THE PRICKLY-PEAR 'COCHINEAL'

The Cochineal Insect.—The cochineal is a small insect belonging to the class of Mealy-bugs. It is dark purple in colour but presents a whitish appearance being marked by a dense waxy covering of bright white colour. The insect is possessed of tubular mouth parts, by fixing which in the tissues of the pear it sucks up the juice of the plant. Each female bug is able to produce a hundred or more young ones in the course of a month. The young bugs are very active and are able to travel from one joint to another, and similarly also from one clump of cactus to a neighbouring one in search of succulent tissues and thus spread the infestation. When the young bug has fixed itself somewhere, it does not shift its place usually. It feeds and grows until it becomes mature in about 4 to 5 weeks. The bug is able to multiply rapidly, so that before long the infestation increases to such an extent that the cactus clump looks as if covered with whitewash. The clumps are killed usually in about 12 to 18 months.

How to introduce the Cochineal.—It is quite an easy matter to carry the cochineal from one place to another. Care should be taken to select only joints bearing fairly mature bugs; they should be carefully cut out and loosely packed in a basket or dealwood box, and can thus be conveyed in a cart to neighbouring villages, or sent by rail even to distant destinations. To infest fresh cactus, one has simply to tie some of the infested joints on to them, taking care to choose a comparatively shady situation for the purpose. The only precaution needed to be taken is to avoid a time of heavy rain or extreme heat for its introduction. Wherever the prickly-pear hedges are continuous, the insect will spread of its own accord from plant to plant, but if the clumps are isolated or scattered, it would be necessary to infect each clump separately to induce quick results.

Replacement of cactus hedges by other plants.—In certain villages the prickly-pear has justly been considered a boon by the cultivators owing to its efficiency in preventing cattle trespass. There is, therefore, a section of the agriculturists who are averse to the extermination of cactus. If, however, the cochineal happens to be introduced into some portion of the village, it is impossible to prevent it from spreading to all the cactus in the neighbourhood sooner or later. It is, therefore, wise to have the cactus replaced as early as possible by some other indigenous or introduced hedge-plant, of which there are many. One of them is *Commiphora (Balsamodendron) berryi*—(Tamil: Mullukkiluvai, Telugu: Chilla Kampa) a plant which forms an efficient and permanent hedge, though rather slow of growth: *Agave wightii*—which is known to function as an efficient quick hedge: *Euphorbia antiquorum*—(Tamil: Chadurakkalli, Telugu: Bommu jamudu), is another good substitute: some kinds of Acacia can also be grown as a thick hedge, if sown thick; also *Prosopis spicifera*—(Tamil: Vanni, Telugu: Jammi) will form a good fence if sown thick and kept trimmed.

A PRACTICAL METHOD OF ESTIMATING DISEASE RESISTANCE IN CROP PLANTS

By K. M. THOMAS, B.A.,

Assistant to Government Mycologist.

Introductory.—The need for the control of plant diseases is being increasingly recognized all over the world and a variety of preventive and curative methods have been discovered and developed during the last century. The discovery of fungicides in the form of seed steeps, spray fluids and dusts, marks a distinct advance in agricultural science. But such *direct* methods of disease control are at best palliatives of a temporary nature that their limitations are sufficiently patent to the farmer as well as to the student of agriculture. Such methods are, moreover, found to be practicable and economical in so few cases that their successful application is bound to be restricted to a limited number of crop diseases even in the most agriculturally developed countries.

Growing demand for disease resistant stock.—The utilization of natural resistance as an indirect means of fighting pests and diseases is rapidly gaining popularity in the field of agricultural science. Consequently, plant pathologists all over the world are directing their efforts to exploit this avenue as the surest and, in the long run, the cheapest method of disease control. As instances of the achievements of scientists in producing plants resistant to diseases may be mentioned, blight-resistant potatoes, rust-resistant wheats, wilt-proof cottons, mosaic-free sugarcanes, canker-resistant apples, mildew-resistant roses, wilt-free melons, leaf-disease-resistant coffees, etc. These and several other achievements in this line have created an ever-growing demand for breeding crop plants which possess the natural resistance against almost every conceivable kind of disease.

The technique of breeding for disease resistance.—The breeding of crop plants for disease resistance is a brilliant example of team work among specialists in different branches of agricultural science. The agricultural economist leads the way by stipulating the desirable qualities in a plant which find favour with the farmer from the latter's economic point of view. With the acquisition of this valuable knowledge, the pathologist studies the diseases pertaining to the crop, the factors favouring their development, the relative degree of resistance among varieties and the specific characters which govern resistance. The plant breeder in his turn steps in either to select and propagate existing varieties which satisfy the demands of the economist and the pathologist or to evolve new strains in which the desirable characters of one or more varieties are blended.

Methods of evaluating disease resistance.—An important item in the pathologist's duties is the imposition of a rigorous test on the available

varieties and strains and to award them correct locations in a scale of disease resistance. Inoculations of plants with parasitic organisms which are so common a practice in pathological investigations are sometimes used for this purpose. But, often they are of very limited value for the purpose inasmuch as the host plants are perforce raised under artificial conditions and the method is therefore unreliable in correctly adjudging the relative resistance of a number of varieties. An attempt was made at Coimbatore to devise a practical and at the same time reliable means of determining disease resistance among varieties on a relative scale and in this article is described the method designed and developed for the purpose and successfully employed in the case of three important diseases, viz., 'Blast' (*Piricularia oryzae*) of paddy, 'Mosaic' (virus disease) of sugarcane and 'Wilt' (*Rhizoctonia bataticola*) of groundnuts.

The principles underlying the method.—The broad principles to be observed in formulating a method of resistance determination among a number of varieties are :—

(1) Growing of varieties and strains under natural conditions and under identical environment, viz., soil, climate, cultivation, manuring, water supply, etc.

(2) Provision of identical facilities to all varieties for exposure to infection and natural development of the disease.

(3) Growing of a sufficiently large number of individuals in each variety to obviate inevitable errors of observation made on a few individuals.

(4) A close study of an equal number of individuals in a variety and a correct estimation of the incidence of disease.

(5) Evaluation of the extent of disease and the loss due to it among the several varieties under trial.

Lay-out of varieties and the methods of observation.—The details of the lay-out employed for each crop and the methods of observation are outlined in the following paragraphs.

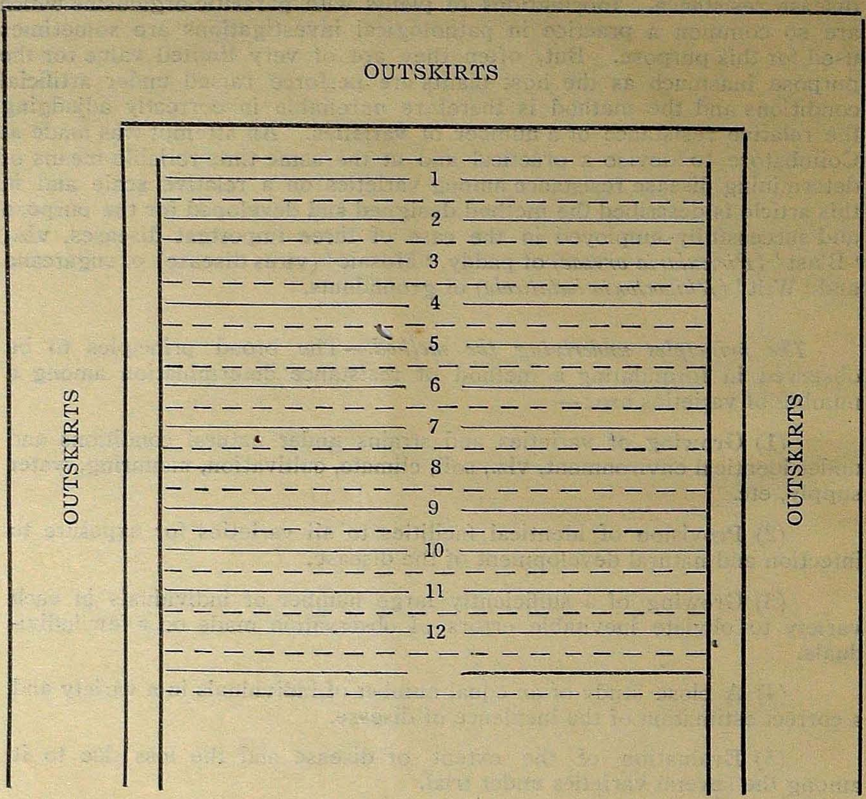
I

Crop.—PADDY. (IRRIGATED) *Disease.*—'BLAST.'

Cultivation of Paddy.—Seedlings are raised from seed in nurseries under swampy conditions. Transplanted in land ploughed and puddled under swampy conditions after remaining 5 to 6 weeks in the nursery. Crop matures in 5 to 6 months.

Nature of the disease.—Caused by a fungus (*Piricularia oryzae*). The fungus forms leafspots and rotten necks and nodes which bear myriads of spores. Spores are spread by wind and rain from plant to plant. Affected plants either dry up completely or produce chaffy ears ; in the latter case the amount of chaff is proportionate to the intensity of the attack on the necks, nodes and ears.

The lay-out of the field was as in the accompanying plan.



——————— Varieties under resistance test.

— — — — — — *Korangu Samba rows.*

No. of varieties	12
Length of varietal row	30 ft.
Distance between adjacent rows ...	1 ft.
Distance between seedlings in a row ...	9 inches.
Number of seedlings per row	41
Area occupied by each series	24 ft. × 30 ft.
Nnmber of replications	4

Outskirts bulk-planted with *Korangu Samba.*

Seedlings of the varieties for trial are raised in special nursery strips from pure seed (pure line selections). Healthy seedlings of uniform growth are transplanted in a series in parallel equidistant rows 30 feet long, each row representing a variety as in the plan. The distance between two adjacent varietal rows was two feet and that between seedlings in a row 9 inches. Every varietal row was alternated by a row of *Korangu Samba,* a variety known to be highly susceptible to Blast disease. The series (of

12 varieties) was replicated four times, so that the four series (including the alternate rows of Korangu Samba) occupied a rectangular area 96 feet by 30 feet. Leaving a path two feet wide on all sides, the outskirts of the block was bulk-planted with *Korangu Samba*, so that once the *Korangu Samba* outskirts and from them the *Korangu Samba* rows have taken the infection, the varietal rows which are surrounded by this susceptible variety on all sides will have equal opportunities of spore infection.

Methods of observation and recording of results.—Each varietal row is harvested as soon as the grains are ripe and all the tillers in a row are individually examined and classified as 'healthy' or 'infected' according to the presence of fungus attack on the nodes, neck and panicle, the latter class being again sub-classified as 'lightly infected' or 'heavily infected' according to the extent to which grain development suffers. The crop from each row is separately threshed, the grain and chaff separated by water, dried, and the percentage of chaff determined by volume.

The results are recorded in the tabular form given below :—

Number	Series	Variety	Duration (in days)	No. of plants	No. of tillers	No. of infected tillers	Percentage	No. of heavily infected tillers	Percentage	Yield (by volume)	Grain (by volume)	Chaff (by volume)	Percentage of chaff	Remarks

The order of resistance is determined with reference to the percentage of heavily infected tillers and the percentage of chaff.

II

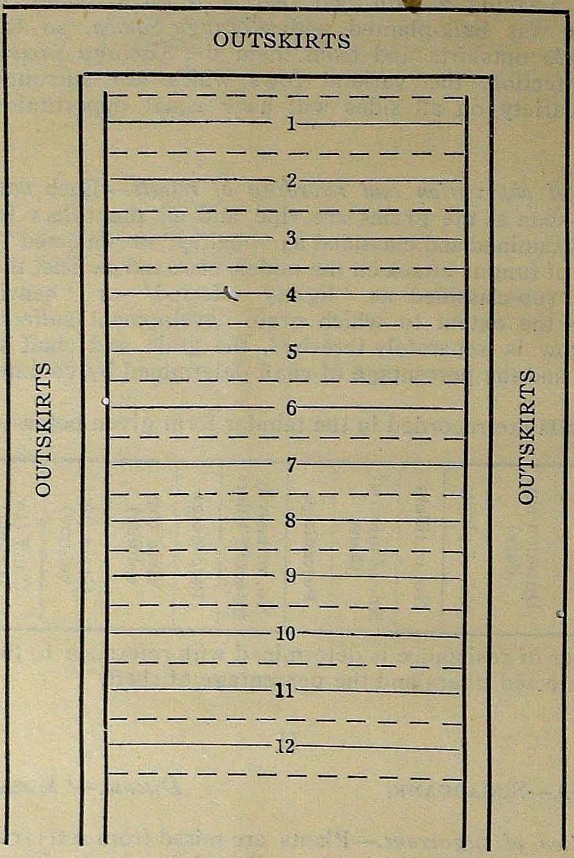
Crop.—SUGARCANE. *Disease.*—'MOSAIC.'

Cultivation of sugarcane.—Plants are raised from setts (cuttings of the cane) which are buried flat in the soil and irrigated. The latent buds develop into seedlings which in their turn produce several tillers. The crop matures in 10 to 12 months.

Nature of the disease.—The disease is caused by a virus which is transmitted through diseased setts and from infected plants to healthy ones by an insect agency[1]. Infection extends for a period of five months between the third and eighth months of the crop. Infected plants show a peculiar mottling of the leaves which produces a mosaic pattern on the leaves and sometimes on the lowest internodes of the cane. Infection is judged by the eye, the surest test for infection being the examination of the spindle or the unfolding central leaf. The disease invariably occurs in plants raised from infected setts.

[1] The exact insect vector which carries mosaic infection in Coimbatore has not been determined. The burden of evidence, however, is in favour of *Aphis maidis* which is known to transmit the disease in other countries.

The plan of experiment to determine relative resistance among sugar-cane varieties is given below :—



– – – – – – Rows of infected Red Mauritius.

———————— Varieties under resistance test.

Distance between adjacent rows	...	2½ feet.
Distance between plants in a row	...	1 foot.
Number of clumps in a row ...	...	31
Number of varieties tested ...	...	24
Area occupied by a series ...	...	60 feet × 30 feet.
Number of replications ...	...	2

Outskirts bulk planted with diseased setts of *Red Mauritius.*

The plan of the experiment is very much as in the case of Blast disease of paddy. But instead of planting the outskirts and the alternate rows with a potentially susceptible variety, they were planted up with infected cane setts which invariably produce diseased seedlings. The varietal rows

are raised from selected healthy setts which give rise to healthy seedlings but the disease gradually spreads to them from the outskirts and from the diseased rows alternating them (1). Chardon and Veve (2) have described a method by which insect transmission of cane mosaic was carried out by planting diseased and healthy setts alternately within a field cage. But that method is obviously impracticable for a comparative test of several varieties. Kunkel (3) used a similar method but without the use of a cage, for determining the loss caused by mosaic on commercial canes. The writer had no access to either of these when the present method was originally tried and considers that the Coimbatore method is better adapted for the purpose of determining disease resistance when a number of varieties are concerned.

Methods of observation and recording of results.—Fortnightly observations are made of each varietal row and the number of healthy and infected canes in them noted. The final figures are recorded in the tabular form below:—

No.	Series	Variety	No. of clumps per row	No. of infected clumps	Percentage of infected clumps	Effect of the disease on the crop	Remarks

The order of resistance is determined by the percentage of infection among the varieties.

III

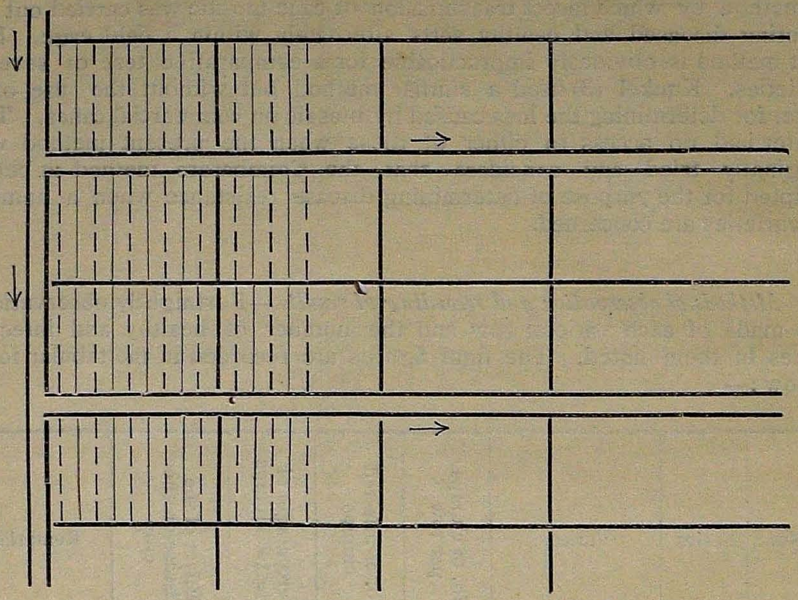
Crop.—GROUNDNUTS (IRRIGATED). *Disease.*—'WILT.'

(*Macrophomina phaseoli* = *R. bataticola*).

Cultivation of Groundnuts.—The crop is raised in rectangular beds 8 feet by 6 feet which are irrigated through channels running between alternate rows of beds. There are two distinct types of plants, viz. (1) the spreading type, and (2) the erect or bunchy type.

Nature of the disease.—The disease is caused by a fungus which produces Sclerotia in the soil and on the underground portions of infected plants. Infected plants either wilt completely or the pods (which are borne underground) are attacked and their development stiffled. In the former case, Sclerotia are formed on the roots and collar of wilted plants and in the latter on the pods.

The lay-out of the field is done in a previously infected field as in the plan below :—



———— Varieties under resistance test.

– – – – Rows of an erect variety (*Gudiatam bunch*).

Size of beds	8 ft. × 6 ft.
Length of rows	24 ft.
Distance between rows	1 foot.
Distance between plants in a row ...	9 inches.
Number of replications	4

⟶ Direction of irrigation water.

The varieties for trial are planted in rows which run through the beds but alternate rows are planted up with a bunch variety (non-experimental) with a view to prevent the interlocking of the plants and the consequent mixture of the pods when two spreading varieties are planted side by side. The rows adjacent to the margins of ridges and channels are also planted up with the same bunch variety and treated as non-experimental outskirts.

Methods of observation and recording of results.—Soon after germination a record is taken of the number of plants per row. The wilted plants are periodically noted and marked. As the crop matures the varietal rows are separately harvested, the pods individually examined and classified as infected or free.

The results are recorded in the tabular form below :—

No.	Series	Variety	No. of plants per row	No. of wilted plants	Percentage	Total number of pods	Number of infected pods	Percentage	Remarks

The order of resistance is determined with reference to the percentage of completely wilted plants and the percentage of infected pods.

It will be found from the above notes that while the broad principles underlying the trial of different varieties are essentially the same in all cases, suitable modifications are necessary in the lay-out of the fields to suit the differences in the methods of cultivation and the nature of the disease. When several replications are made, the order of planting the varieties may be randomized in order to minimise errors which may arise from differences in soil conditions.

Possibilities of extension in the application of the method.—The method outlined in the foregoing paragraphs appears to be suitable for evaluating disease resistance in all crop plants which are prolific in varieties. While the writer's experience is confined to three annual crops, it is presumed that this method is admirably suited for gauging resistance among varieties not only of annual crops but also of perennial crops like Coffee, Coconuts, Tea, Mangoes, Apples, Cinchona, etc., where there is the obvious advantage of carrying out observations through several years and under different conditions of rainfall, humidity, temperature, etc. With suitable modifications, the method promises to be useful not only for diseases caused by fungi, bacteria and viruses but also for diseases and pests caused by protozoa, insects, nematodes, mites, etc.

Acknowledgments.—The writer has pleasure in acknowledging his indebtedness to M. R. Ry. S. Sundararaman Avl., M.A., for guidance and for affording all facilities for pursuing this line of work.

Literature cited

1. Sundararaman, S.... The Mosaic Disease of Sugarcane, *Madras Agricul. Dept. Bulletin No.* 92. p. 11.
2. Chardon and Veve....The transmission of sugarcane mosaic by *Aphis maidis* under field conditions in Porto Rico, *Phytopathology*, xiii, pp. 24-29.
3. Kunkel, L. O. ...Studies on the mosaic of sugarcane, *Bulletin of the Expt. Stn., of the Hawaiian Sugar Planters' Association* iii, 2. pp. 115-167.

A SHORT NOTE ON THE POMEGRANATE AND ITS CULTIVATION IN SOMANUR (COIMBATORE DISTRICT)

By P. S. SURYANARAYANA AYYAR,
Sub-Assistant in Mycology

Introduction.—The pomegranate is a fruit that has been grown in this country from time immemorial. It is reported to have been introduced into Southern Europe and seems to have travelled further west to America and the West Indian islands. In Europe, Granada in Spain was for a long time famous for its pomegranates, 'the fruits reaching a high degree of perfection in its gentle climate'. The word pomegranate is derived from two words *Pomum Granatum*, literally meaning seeded apple. Linnaeus gave it the scientific name of *Punica granatum*.

Soil.—The plant grows in almost all kinds of soils, but the yield is heaviest on 'deep soils of fairly heavy texture'. It grows also on alkaline soils but then it cannot be expected to yield as well. At Somanur it is found thriving on good red loam tending to be sandy.

Nursery.—For an acre of plantation the nursery required is half a cent. The plot is well dug up with an ordinary mamutty, a month before the actual sowing time. About 10 basketfuls of ashes, village sweepings or cattle manure are added to the soil and well mixed up and the plot levelled.

For sowing, seeds are carefully selected. About a dozen well ripened fruits are picked from a mature and healthy tree (10 to 15 years in age), the rind is removed and the juice squeezed out so that only the seeds are left behind. The selection of the fruits should be such that all the desirable qualities of a good fruit are present in them. The naked seeds are then well mixed with ashes and the mixture dried in the sun for about ten days. It is not definitely known how long the seeds can be kept in this state without getting their vitality impaired. Anyway they seem to keep well for about 2 to 3 months.

Having prepared the nursery as described above, it is divided into small convenient beds. The seeds are then sown broadcast in these beds and covered. Then irrigation begins which should be repeated once in two days until the seeds germinate. The usual time to raise the nursery is August-September. Sprouts appear above ground only after one to one and a half month. The intervals between waterings are then longer i.e., twice a week for another 3 months. The nursery is kept clean of weeds. After the fifth month waterings are given once a week. The seedlings may be allowed to grow in this state for a year. Throughout the nursery life no further manure is applied. The plants are ready for transplanting when one year old.

Layering.—This is another method by which plants are raised. Having selected a good tree the desired branches are bent, if necessary, so that a portion touches the ground and these are covered with earth and weighted. The trees should be 6 to 10 years old. This branch takes nearly a year

before striking root and when once it has done so, it can safely be transplanted. The new plant is separated from the parent tree and carefully lifted with a ball of earth round the roots and planted in the pit made ready to receive it.

It is a custom in some parts to plant the cuttings straightaway without any layering or attempt to make it strike root—like the rose or grape-vine cuttings. The difference between the plants raised from seeds and those from layerings is that the former takes about five years to bear fruit, while the latter begins to yield the next season. It is generally believed here that the trees raised by layering deteriorate sooner than the seed-raised trees.

Planting.—300 to 350 seedlings can be planted in an acre. A month or even more before transplantation, pits are dug and kept ready to receive the seedlings. The pits are 2′ x 2′ x 2′. They are dug generally during September–October and are manured at the rate of 2 basketfuls of village sweepings or tank silt per pit. Before pulling out the seedlings, the nursery is watered the previous day. Now the plants are lifted carefully and planted singly in the pits. A seedling when one year old will be 2 to 2½ feet high. It is planted leaving one foot of the shoot projecting above ground. All the plants are watered at once after the transplantation. The whole garden will have to be irrigated twice a week till the young plants put forth fresh leaves. Irrigation is unnecessary if rain intervenes.

Irrigation and after-cultivation.—After the plants are well established, the number of irrigations is reduced to one a month. The land is cultivated with a garden crop as *Ragi*, onions or sweet potatoes. By growing crops mentioned above, the garden is kept clean and therefore no special after-cultivation is found necessary for about 3 years. There being only 300 plants to an acre (and each plant being only 1 foot high) all the area can be successfully cultivated for about 2 years. The pomegranate withstands drought for a long period. On account of its resistance, it is possible and even desirable to grow good varieties in regions where water is scarce or the supply irregular. Once the plants begin to bear, the whole garden has to be kept clean and in a good state of tilth. For this purpose mamutty digging is generally given twice a year and also manure is applied. Green leaves can be dug in with profit (if they are available) or any bulky manure at the rate of about 4 or 5 basketfuls per tree.

Pruning.—No systematic pruning is done except cutting out the dead twigs and branches. This can be successfully introduced by actual demonstration. By intelligent pruning many plants can be made to bear more fruits and those that do not bear at all can be induced to fruit.

Harvesting.—It is possible that the trees will begin to bear even in the the third year of transplanting. Normally they do so in the fourth year. The fruits are to be gathered, the garden should not be watered and the trees allowed to shed their leaves completely, which will be about December or January. Even if there are any green leaves left, have them removed so that the whole garden will look very bare. It should be in this state till it rains in April or May. It is believed that the more a tree sheds, the more it will bear afterwards. After a good rain the garden is well weeded, dug and manured with cattle manure and green leaf. It should now be regularly irrigated so that all the trees will put forth fresh shoots and begin to flower profusely. In a month or two the whole garden will be full of small fruits. In about another two or three months they are ready for

harvest. In this connection one thing should be noted and that is all the fruits do not come to maturity at the same time. For naturally some flowers come up earlier and become fruits earlier too. The harvest is done two or three times leaving an interval of about 15 days to a month between each harvest. Usually the ryot does not harvest them himself as he gives out the garden to the local contractor for a specific amount ranging from Rs. 300 to 600 (for an acre according to the stand of the crop) and he comes and takes away the produce at his own convenience. The ryot may realise for the first year about Rs. 300 and this will gradually go up to a maximum of about Rs. 600 in about 7 years. (*Note.*—A good tree will yield about 30 to 40 mature fruits.)

Uses of pomegranate.—This fruit can be put to various uses. Primarily it is an excellent fruit quenching the thirst to a very remarkable degree. The quality of the fruit varies according to the variety and different localities. Those got from North-Western Provinces are supposed to be the best obtainable in India. Of course better fruits are got from Persia and Afghanistan from where large quantities are imported into this country. The keeping qualities of the fruit are very good and it is said they can be kept as long as six months without in any way injuring their freshness and palatability.

'A very cooling drink is prepared from the pulp and is said everybody appreciates it that has got a chance to taste it.'

'In Syria the fruit is cut open, the arils are extracted and stewed with sugar, sprinkled with rose water and served on little plates, this being considered a dish of rare excellence' (*The Pomegranate.* By R. W. Hodgson).

The flowers, the bark, the rind and the seeds of the fruit can be used as a dye or tan.

Dye and Tan.—The flowers are used in various parts of India to impart a light red colour, said to be fleeting, to clothes. The astringeut rind of the fruit is a valuable tan and is also frequently employed as an auxiliary to the colouring agents (generally turmeric and indigo) in dyeing. Alone it imparts to clothes a greenish colour. The bark is similarly used as a dyeing auxiliary but its chief value is a tan and a dye for the leather. It is largely employed in preparing Morocco leather of Tangiers.

'Samples of rind examined by Mr. Wardle were found to contain a moderate amount of yellow colouring matter readily given up to boiling water which gave colours varying from a dull yellowish green to a bright reddish drab with tassur and corah silk and cotton.'

'It contains about 25 per cent of tannic acid which with the combination of iron salts may be made to produce an almost black dye on wool.'

Uses as medicine.—'The fresh juice is used as an ingredient of cooling and refrigerant mixtures and of some medicines for dyspepsia. The rind is valued as an astringent in cases of diarrhœa and dysentery. Ainshi, however informs us that the Mohammedan physicians besides using the flowers and the rind in a variety of ways on account of their astringency, recommended the root bark as the most stringent part of the plant and moreover considered it a perfect specific in cases of tape-worm. The seeds are believed to be a stomachic; the pulp cardiacal and stomachic; the flowers and buds styptic and cicatrizing.

'The root bark is also employed as an astringent application for relaxed sore throat and as a wash in case of uterine diseases. Dr. Kirkpatrick is quoted in the Pharmocopœa of India as stating that the decoction of the rind with cloves was the best remedy he knew for the chronic form of dysentery from which poor people of India suffer' (Watt's *Industrial Products of India*).

Pests and diseases.—The pomegranate suffers from a Cercospora [lythracearum (?)] which attacks both the leaves and fruits. The life history of the fungus is not yet completely worked out. An Aspergillus (*Sterigmatocystis castenea*) has been recorded to be doing a great deal of harm to the fruits in America (R. W. Hodgson).[1] Recently a Colletotrichum was also recorded in this province to produce a 'blossom-end-rot'. The pathogenicity of the organism is under investigation.

The chief remedial measures lie in taking good sanitary measures such as plucking out rotten and diseased fruits, twigs and leaves and burning them and keeping the garden under clean cultivation. In addition to the above one or two good sprayings with Alum Bordeaux mixture (1 per cent) will go a great way in keeping down almost all fungus diseases.

The pomegranate butterfly (*Virachola isocrates*) is reported to be a very bad pest for these fruits. It is the caterpillar that does the damage. The adult lays the eggs inside the flower buds and the larvae bore into the fruit and develope inside eating it meanwhile. They pupate there and emerge as butterflies. Once they begin, a lot of harm is being done by them. The prevention lies in not allowing the adults to lay eggs in the buds or flowers or fruits which may be done by tying paper or muslin bags to all the fruits in time (in very early stages).

Economics of cultivation.—The following is the approximate cost of cultivation of pomegranates in an acre in this village.

	RS.	A.	P.
Nursery—Preparation of—			
Digging with mamutty for ½ a day at 8 annas a day ...	0	4	0
Manuring with ashes at ½ anna per basket—10 baskets ...	0	5	0
10 good fruits at 2 annas each (for seed)	1	4	0
Total for the preparation of the nursery ...	1	13	0
Preparation of the garden (*1 acre*)—			
Preliminary cultivation—			
Digging 300 pits (2′ × 2′ × 2′) at 10 pits per rupee ...	30	0	0
Manuring—			
10 cart-loads of farm-yard manure at Re. 1-8-0 per cart-load	15	0	0
Spreading the manure. 2 men at 8 annas	1	0	0
Transplanting the seedlings—			
3 men at 8 annas per day	1	8	0
Irrigation—			
For the first year after transplanting 24 irrigations at Rs. 2-8-0 per time	60	0	0
Total expenses for the first year ...	109	5	0

[1] Hodgson, R. W., *The Pomegranate.*

	RS.	A.	P.
2nd year—			
Digging and weeding at Rs. 10 per acre	10	0	0
Irrigation	60	0	0
Total for second year ...	70	0	0
3rd year—			
Digging and weeding at Rs. 10 per acre	10	0	0
Irrigation	60	0	0
Total for third year ...	70	0	0
Assessment for 3 years at Rs. 2-8-0 per acre ...	7	8	0
Total expenses for the first 3 years ...	256	13	0

The cost of a permanent wire fencing is not given as the ryots usually put up a prickly pear fence which serves well for all ordinary purposes. This is not after all very costly and hence omitted. Normally the trees begin to bear in the fourth year and hence the return is calculated only for that year.

	RS.	A.	P.
4th year—			
Digging and weeding	10	0	0
Manuring—			
20 cart-loads at Re. 1-8-0 per cart	30	0	0
Irrigation—			
For 5 months at 2 irrigations per week (at Rs. 2-8-0 per irrigation)	100	0	0
Watch—			
1 man at Rs. 10 per month, for 5 months	50	0	0
Assessment	2	8	0
Total for fourth year ...	192	8	0
Total expenses so far incurred ...	449	5	0

Returns—

	RS.
In the fourth year if the ryot leases out the garden to a contractor he may realize normally	150 to 200
So far the ryot has spent about	450
For the fourth year he gets	250

5th year—

	RS.	A.	P.
Expenses as in fourth year	192	8	0
Deficit from the previous year	250	0	0
Total ...	442	8	0
Income for the year	400	0	0

This year also he has a minus balance of about Rs. 42-8-0.

6th year—

Expenses as fifth year	192	8	0
Deficit from last year	42	8	0
Total ...	235	0	0

He realizes this year about Rs. 600. And so has a gain of about Rs. 365.

From this year onwards he will be gaining a net amount of nearly Rs. 40 every year throughout the life of the garden which is about 30 to 40 years.

The maximum expectations from an acre (taking the present demand for fruits into consideration) will be about Rs. 600 during normal years, i.e., if no diseases intervene.

Interest has not been calculated on the above calculations.

Note.—During the middle of June 1930, the writer was asked to proceed to a pomegranate garden at Somanur and do some spraying work there to prevent the spread of a disease. The disease was in a very severe form when the garden was visited and had it continued for sometime longer there would have been practically no good fruits. The owner had great expectations and thought of getting easily Rs. 600. But the disease intervened and very nearly spoiled everything. The spraying given acted as a good check in preventing its spread and he realized about one-half of the expected sum.

The writer wishes to express his gratitude to M. R. Ry. S. Sundararaman Avergal, Government Mycologist, for giving him an opportunity to make the above observations and for guidance in the preparation of this paper.

THE SUNSHINE RECORDER AND SOME INTERESTING WEATHER DATA

By B. S. NARASIMHAN, L. Ag.,
Assistant to Government Agricultural Chemist.

Of all the manifested forces of nature, the Sun probably is the most important for life on earth. Every activity of living beings, both animals and plants can ultimately be traced to the apparently inexhaustible store of solar energy. Horses, cattle and men derive their physical energy from it, all kinds of vegetation thrive wonderfully in sunlight and die when it is denied to them. Water-power used by men whether it be river or waterfall, owes its origin to the action of the sun. Coal and petroleum are in fact stored up reservoirs from the stream of solar energy, for these are but the vegetation of past ages conserved in the entrails of the earth.

The sun even exerts a mental influence. It is associated with joy and the bright side of life. The sleeper is awakened from his lazy bed by the rays of the early morning sun; the dull dreary feeling caused by days of cloudy weather is dissipated by the appearance of the bright sun and one is whipped up to energy and feels more active and cheerful than before. All nature herself smiles at the appearance of the sun, the flowers open out, the bees hum, the crickets chirp and one shares with Browning, the feeling that 'God is in His Heaven and all is right with the World'. The sun is therefore rightly named as *Poornasthamo Mochakah* (the destroyer of all *thamas*).

Recent researches have shown the importance of sun and sunlight, for the promotion of vitamins; the advocates of unfired food and votaries of sundried vegetables and fruits base their theories on this fact. Perhaps, the custom prevalent in many parts of the country of exposing coconut and gingelly oils to the rays of the sun can be traced to this, for these vegetable products are low in vitamins and exposure to the sun enriches their vitamin content.

Small wonder that through ages past the sun has played an important part in the religions of the world. To the ancient Copts of Egypt, Ra, the Sun God, was the supreme of all deities; the Greeks worshipped Him as Helios and identified him with light and joy in the world; the Zoroastrians are even to-day ardent sun-worshippers. The Pongal festival is after all a significantly thanksgiving festival wherein prayers are offered and gratitude expressed to God Surya, for a bounteous harvest. Rightly indeed did the Rig Veda hymn sing of "Savitur, the Sun God; Savitur, Lord of every blessing and God Savitur, the Gold eyed, hath come hither giving the choice treasures unto him who worship". (Rig Veda X. 149 i, 35).

It will thus be seen that a study of sunshine and sunlight at different parts of the globe will have important bearing on agriculture. In fact the amount of sunshine received at any particular place depends chiefly on its latitude and we have thus regions ranging from the Frigid zone to the

'golden sands' of mid-Africa where the 'naked negro pants at the equatorial line". This difference also determines the flora and the fauna of earth's different belts. The cold Arctic regions abound with moss and lichens, vegetations free from chlorophyll and characteristic of the absence of sunlight. The luxuriance of a Tropical growth 'running riot in many a wild fastoon', is never seen in the Temperate regions.

The hours of bright sunshine at different places during different periods of the year, will, if measured, thus give interesting data for academic and agricultural interests. A very simple device is being used to record the hours and intensity of sushine at any place and the instrument used for this purpose is called the 'Sunshine Recorder'. It consists of a sphere of glass about 4 inches in diameter just above a metal frame which is itself the arc of a sphere and concentric with the glass globe. Rays of sun falling on the glass are brought to a focus behind it in the plane of the metal frame. A sensitized paper, graduated into hours, and tenths of hours inserted in a groove of the metal frame thus gets burnt off to different degrees along a regular line depending on the degree of intensity. A number of foci which correspond with the different positions of the sun during its passage through the heavens are thus marked on the paper from which we can accurately get (*a*) the number of hours of sunshine during the day, (*b*) the hours when the sun was brightest, and (*c*) the hours when there was no sun at all. The instrument before installation has to be adjusted, so that its central plane makes with the horizon an angle equal to the latitude of the locality. In this position, the rays of the sun always fall perpendicularly on the surface of glass and the several foci will be on the same line. The location of the instrument should be in such a place as offers no obstruction to the rays of the sun by the proximity of trees and tall buildings. The metal belt below the spherical glass is divided into three arcs in different planes all concentric with the sphere. Such an arrangement permits the insertion of the sensitized cards into any one of the three grooves. This, therefore, permits an adjustment of the instrument to suit the change of direction of the sun in its passage through the highway of the heavens. Three types of cards, equinoctial, winter and summer are, therefore, used for the different periods of the year; the equinoctial being used from the March 1 to April 12 and from September 1 to October 12, the summer from April 13 to August 31 and the winter from October 13 to the last day of February. The lay impression might well be that the total hours of sunshine per day are twelve,—from sunrise to sunset. This, however, is not the case. And at this stage, it must be pointed out that sunlight is different from sunshine, for, long after the instrument finishes up recording the amount of sunshine, sunlight may still be available to earth. On an average, the amount of sunshine received is about 7 or 8 hours a day, although on particular days of the year as many as 11·3 hours have been recorded at Coimbatore.

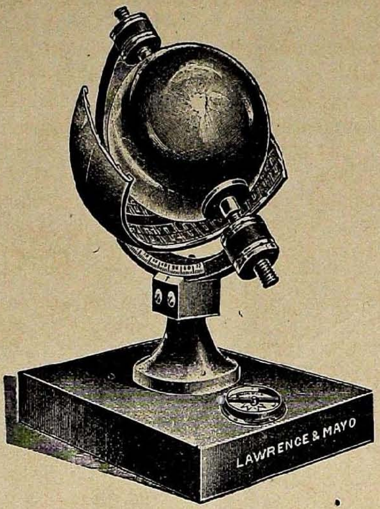
The sunshine recorder was installed in August 1928 at the Agricultural College, Coimbatore, and has been located on the top of the Freeman Building. The Research Institute terrace although much higher could not be thought of, as the several minarets peculiar to its Indo-Saracenic style, will cast shadows on the instrument when the sun is low on the horizon. The Freeman Building which conforms to the Doric style of architecture is more suitable with its flat terrace.

Records maintained since then and tabulated so far, have been represented graphically for a period of two years from September 1928 to September 1930. It will be seen from Graph II, that January, March and May are by far the sunniest months of the year, February and April following as close seconds. June and July (the months of South-West monsoon) have the least sunshine, while the winter months, October, November and December and the transition between the two monsoons, August and September, are months with average sunshine. It is, of course, wrong to jump to generalizations from two years' data but the general trend of sunshine throughout the year is on the lines indicated above. Incidentally, is borne out the general belief that Coimbatore has an agreeable climate for, strictly speaking, only two months in the year, January and March are the sunniest.

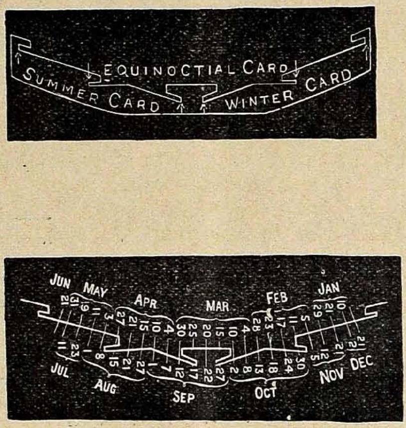
Temperature figures both maximum and minimum for all the months for these two years are given in Graph III and Mean Humidity in Graph I. Graph III shows that March, April and May are also the hottest months of the year, while January is the coldest, although January is only second to March among the months in the hours of sunshine recorded. This illustrates how the sunniest month need not necessarily be the hottest, for there are other factors like humidity, playing a part. The amount of rainfall received has thus an important bearing for it is chiefly that, which influences the humidity in the atmosphere. In a later paper, an attempt will be made to trace the relation between rainfall and certain other weather characters. From these two years figures of sunshine record, one can safely say, that March is the hottest, driest and the sunniest month at Coimbatore.

Various are the uses to which the figures obtained by the Sunshine Recorder can be put. The instrument affords valuable data for the location of solar heaters, a device which is becoming popular in America and elsewhere. The solar heater is an arrangement by which an attempt is made successfully to harness the sun's energy for human comforts. A plate of glass inclined at the correct angle and receiving the sun's rays on it, transmits it into an absorber of non-conducting material, with the result, that light rays are utilized to produce heat and it is claimed that with the arrangement, water can be raised to boiling point. The importance of procuring hot water in dairies, cattle sheds and other agricultural buildings at such low cost cannot be over-estimated. The location, however, of the solar heater depends on the preliminary data obtained from sunshine recorder, for, these decide the inclination, situation and the value of the solar constant with the locality. In fact, the solar constant is the unit value of the radiation from the sun and is the theoretical amount of heat which a square centimeter of the earth's surface would receive per unit of time. It depends on the medium of the atmosphere whether it is clear or misty, on the number of hours of sunshine per day, and the nature and colour of the surface receiving. Thus, from Mont Blanc in Switzerland to observatories in South America, the solar constant is found to vary from 1·44 to 2·2 depending on one or all of these factors.

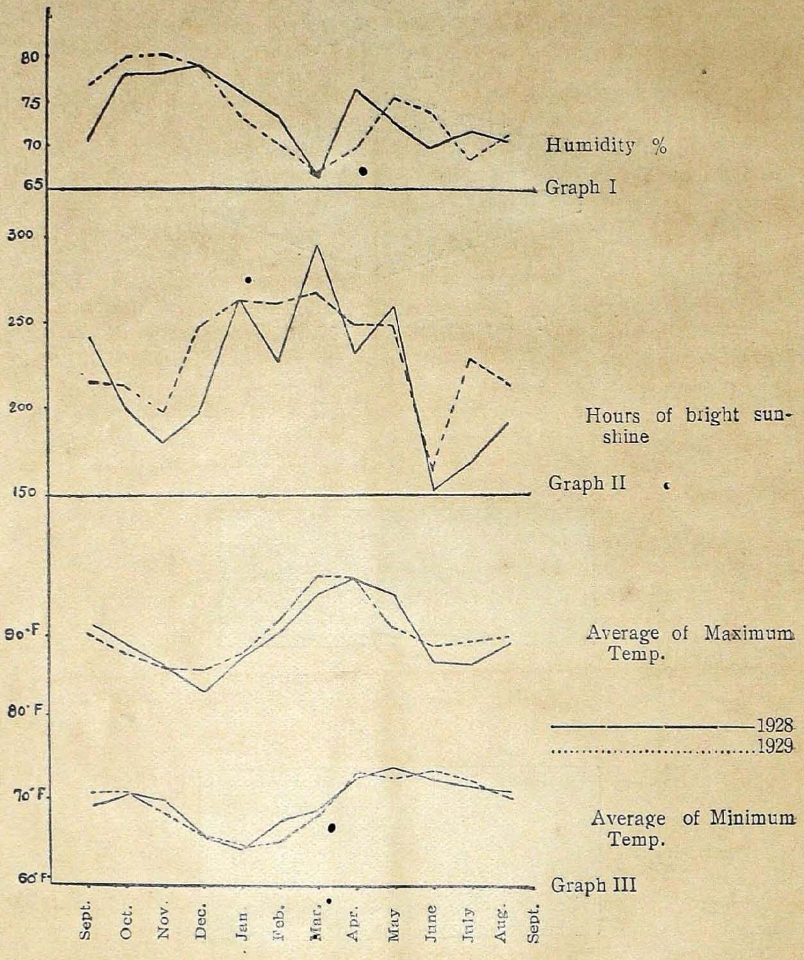
To the breeder and crop specialist, figures obtained from the sunshine recorder will be of importance for correlating the phases of growth of different crops, with the hours of sunshine during different periods of the year. The cotton plant in fact has been known to burst its bolls on sunny days and who knows but that ability to accommodate itself to different degrees of sunniness may be an economic factor in judging a variety of



THE SUNSHINE RECORDER



TYPES OF CHARTS USED TO RECORD SUNSHINE


80
75
70
65
Humidity %
Graph I
300
250
200
150
Hours of bright sunshine
Graph II
90°F
80°F
70°F
60°F
Average of Maximum Temp.
1928
1929
Average of Minimum Temp.
Graph III
Sept.
Oct.
Nov.
Dec.
Jan
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.

cotton evolved. To the bacteriologist dealing with bacteria thriving in different seasons of the year, the figures will afford valuable clue for propagation of beneficent and destruction of harmful bacteria.

Year	Months	Monthly total bright sunshine hours	Mean Temperature		Mean Humidity %
			Maximum °F	Minimum °F	
1928	September	246·5	90·7	69·3	70·4
	October	200·3	88·5	70·9	78·3
	November	179·6	85·5	69·9	78·1
	December	197·2	82·9	65·7	79·2
1929	January	262·3	86·7	64·0	76·1
	February	227·4	89·9	67·5	73·4
	March	295·7	94·8	69·0	66·2
	April	231·6	96·3	72·7	76·6
	May	259·8	94·2	73·5	72·3
	June	150·7	86·3	72·2	69·7
	July	165·6	86·2	71·9	71·8
	August	192·8	88·7	70·7	70·6
	Average for 1928–29 ...	217·4	89·2	69·8	73·5
1929	September	215·2	89·7	70·7	76·3
	October	213·8	87·2	70·9	80·1
	November	199·1	85·7	68·5	81·1
	December	247·4	85·4	65·5	79·4
1930	January	263·7	87·3	64·5	73·8
	February	260·6	91·2	65·3	70·4
	March	265·7	96·5	68·0	67·1
	April	249·8	96·3	73·2	69·5
	May	248·4	91·7	72·5	75·6
	June	160·7	88·4	73·2	73·7
	July	226·6	89·0	71·0	68·2
	August	212·5	89·4	70·9	71·5
	Average for 1929–30 ...	225·3	89·8	69·6	73·9

A NEW PADDY DISEASE IN MADRAS

By K. M. THOMAS, B.A.,

Assistant to the Government Mycologist.

In March 1930, a report was received from the Agricultural Research Station, Maruter (Godavari Delta) about a Paddy disease which seriously affected the *dalva* (second season) crop of *Garikasannavari* in the Station plots. The investigation of the disease was immediately taken up and a fungus which was isolated from diseased plants and subsequently proved to be the cause of the disease is now under detailed study at Coimbatore. A popular account of the preliminary investigations is given in this article with the hope that it will attract the attention of those interested in Paddy growing to what appears to be a disease new to Madras and help to gather information regarding the distribution of the disease, extent of loss, the varieties susceptible to the disease and other information which would be useful for the detailed study of the disease.

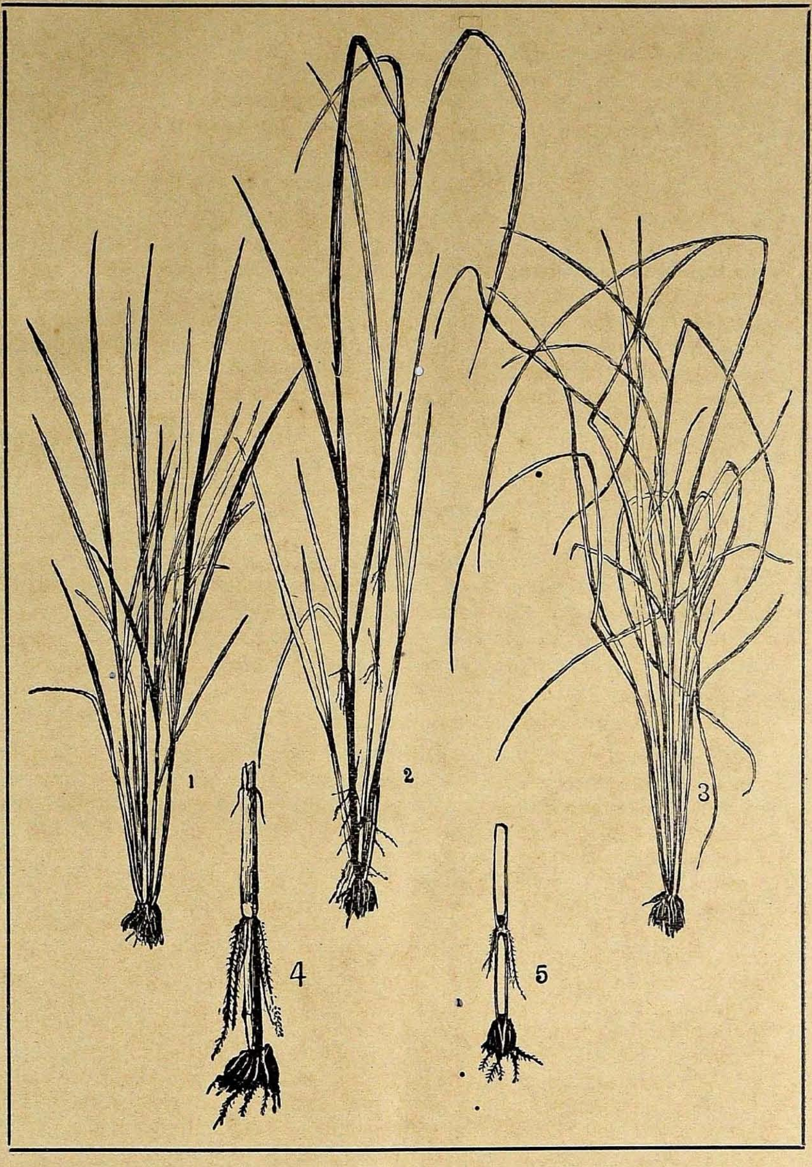
Symptoms of the disease.—The symptoms of the disease as observed in the variety *Garikasannavari* are the following :—

1. When the disease occurs in the nursery, the affected seedlings grow pale and thin, subsequently dying out. Some which survive the nursery stage, die out on transplantation. Such seedlings do not die in patches but are distributed throughout the beds.

2. In a grown up crop, the most characteristic external symptom is the appearance here and there of tall lanky tillers which come into 'shot blade' earlier than the rest of the crop, but bearing pale green flags which shoot up conspicuously above the general level of the crop (Fig. 2). The average of 32 random measurements of the heights of normal plants worked at 2 feet 6 inches, while that of diseased plants was 3 feet 3 inches. Viewed from a distance on a bright sunny day, such pale flags mar the uniform level of a platform of green leaf tips. There is a corresponding emergence of the culms of the affected plants from their sheaths revealing the base of the internodes. Even the most experienced agriculturist would at first sight take the occurrence of stray plants of such abnormal development to be the result of an admixture of seed of a short duration variety—a feature not uncommon in the average ryots' fields. The abnormal elongation of infected tillers appears to be due to an accelerated growth at the expense of lateral development and a premature effort on the part of the plant to reproduce itself. But plants which show this symptom invariably show fungus attack at the collar region and die within a period of two to six days.

3. As a rule, the leaves of infected plants dry up one after the other from below, their margins first turning brown, while a long strip along both sides of the midrib still remains green. Eventually this green area also turns brown when the leaf curls and droops.

4. Another symptom associated with the disease is the development of adventitious roots from the first, second and sometimes the third node above



A NEW PADDY DISEASE IN MADRAS

1. Healthy plant. 2. Infected plant showing abnormal development of tillers and development of adventitious roots. 3. Plant killed by the disease. 4. The basal portion of a tiller showing development of adventitious roots. 5. The same split open, showing the discoloration at the nodes.

the ground level. The first node above the collar, whether partially or wholly enclosed within its sheath exhibits well-developed roots ranging in length from ½ to 3 inches, while the node above it though completely enclosed shows (on removal of the sheath) either a few developed roots or early signs of such development (Figs. 2, 4 and 5). The extent of growth of these adventitious roots depends on the distance to which the mycelial growth within the culm has progressed upwards.

5. On splitting open the culm of an infected tiller, there is a distinct brown discoloration of the spongy tissue of the nodular region (Fig. 5) confined in early cases of attack to the lowest root-bearing nodes but visible in advanced stages at the upper one or two nodes as well. In the latter case, long before the death of the tiller the fungus growth is found to spread through the hollow of the lowest internode. Though the root-bearing nodes are discoloured within, the underground root system remains intact, showing the healthy white colour.

6. Some plants which have developed the symptoms described above show externally a white or pink bloom of fungus growth at the lowest one or two nodes. This bloom is often conspicuous on the dead sheaths. When the plants are dead, the bloom extends upwards along the sheath up to a distance of four inches above the collar. If the dead plants are left in the field sufficiently long, the fungus growth on the sheath develops into a pink incrustation which consists of a thick matting of mycelium bearing myriads of conidia (spores). When irrigation water stands at a high level, the portion of the sheath under water does not show the white bloom, but when the field gets drained, the bloom is evident down to the ground level. Dead plants when pulled out, snap at the collar, leaving the root system behind.

7. While approaching the flowering stage, some well developed plants show one or two late-developed side tillers infected by the disease while the remaining tillers are apparently healthy. In such cases, the disease is not known to spread to the whole plant.

Distribution of the disease.—The first record of a serious outbreak of the disease in the Madras Presidency was from Maruter (West Godavari District) in March 1930. The disease was noted at this period in several villages within a fifteen mile radius of the Station. An examination of the straw and stubbles of the previous season showed the fungus at the nodes and within the hollow of the internodes, proving thereby that the fungus was not entirely new to the locality. McRae[1] has recorded a *Fusarium* occurring on *Manipuri* and *Gurkhali* varieties at Tamenglong in Manipur State which causes the sterility of rice grains involving the entire failure of the crop as no grain is formed though the plants looked healthy. He collected a similar fungus from Gurdaspur and round about Pusa. Later, he isolated a *Cephalosporium* from Punjab which killed the seedlings and caused a rot at the collar of grown plants. The cultural characters of this fungus agreed with those of the previous one except in the absence of macroconidia. Stray plants affected by a disease almost identical with the Maruter fungus have been obtained from the Paddy Breeding Station, Coimbatore, towards the end of 1930. The fungus has been observed to produce the

[1] McRae, W., *Scientific Reports of the Agricultural Research Institute, Pusa*, 1926-27, p. 54, and 1927-28, p. 68.

Fusarium and the Cephalosporium types of spores, but unlike the Maruter strain, with a predominance of the former. Apart from the minor differences in the details of the symptoms of the disease and the cultural characters it appears that the fungus responsible is the same and has a wide, though discontinuous, distribution in India. Possibly it exists undetected in many paddy tracts.

Microscopic and cultural characters.—Sections through the infected nodes show septate hyaline hyphæ running across the cells and clogging the vessels of the vascular bundles. Sections containing the fungus when left overnight in distilled water, produce a profuse external gr wth of mycelium and spores. The mycelium is hyaline, closely septate and freely branching, producing bunches of conidia at the tips of branches. The microconidia (Cephalosporium) are oblong, hyaline, single celled and measure 5 to 13 $\mu \times$ 3 to 5μ. The macroconidia (Fusarium) are hyaline but pink in mass, elliptic to fusiform, 2 to 5 celled and measure 16 to 48 $\mu \times$ 2·5 to 4 μ. The fungus is a prolific spore bearer and makes good growth on oatmeal agar, rice agar, wheat agar, potato agar and French bean agar, the rate of growth in them being in the order of the media mentioned. When grown on oatmeal agar and French bean agar the fungus imparts a pink tinge to the substratum. Single spore cultures of the Cephalosporium type have given rise to both the Cephalo sporium and Fusarium stages. Wound inoculations kill seedlings in all stages. Contact inoculations produce death in seedlings and the abnormal elongation of tillers in grown plants.

Preventing the spread of the disease.—The fungus grows saprophytically on dead tissue and myriads of spores are borne on dead plants. The stubbles left in infected fields after harvest are found to harbour the mycelium and spores of the fungus. Spores are also found adhering to seed paddy collected from infected areas and to be held in suspension in the irrigation water standing in infected fields. It is therefore probable that the fungus is spread through soil, seed, air and water. Though it is too early to outline definite measures of control from the facts gathered so far, it stands to reason that the systematic collection and destruction of infected plants in a standing crop and of stubbles in infected fields would materially minimise the sources of infection. Since spore production is very heavy after the death of the host plant, infected plants should be pulled out as soon as they are detected and burnt or scorched over a fire to prevent the saprophytic development of spores.

Some field experiments are now in progress at Maruter to study the effect of fungicidal treatments at different stages in the growth of the paddy plant.

YOUTH AND RURAL UPLIFT—A CALL FROM ONE OF THEM

By M. J. DAVID,
Student B.Sc., (*III*).

It is amazing when we begin to think how many of us wander through the vale of life without any particular end in view. We are born, we grow, we act our various parts, and are ultimately consigned to oblivion, without having had any great accomplishment to our credit. We do not realize until we give a thought to it, how much we are slaves to circumstances and how little we try to rise above them so as to look at things from a wider perspective. If we study the lives of world's great men and compare them with ours we will realize what life led by those great men signifies. We will find, that a life lived strenuously for a mighty purpose, is as different from a purposeless life, as light is from darkness. We find in the lives of great men a passion dominating all their activities. It is their singleness of purpose and perseverance that helped them to achieve their goal.

We must follow the footsteps of great men, rise like them to the demand of the times, and lead a useful life rather than an easy indolent one. The duty of building a greater India rests with us. The older men represent mostly spent up forces. They may serve to direct the energies of youth but are unfit for the task themselves. Youth is the period of ardour, enthusiasm, energy, warmth of heart and generosity. The future of the nation depends on how the great potentialities of its youth are nurtured and developed. We must train ourselves by rigid self-discipline, strength of will and conscientious work to direct our abundant energies into useful channels. Sir Henry Bellingham says 'The whirl, excitement and the nervous tension of the life of to-day tend to make men selfish, and exacting, and to teach the young to be impatient of all restraints and to look for incessant amusement that must eventually destroy the moral faculty.' We shall not give cause to such a complaint. Remember that we have duties to perform to blot out the tarnishes on the bright shield of India's honour, to uphold her honour among the nations of the world and to restore her to her pristine glory. We, the young men of to-day, are the citizens of to-morrow, the leaders of future India who will direct the destinies of the motherland. So if we want a better India, an India which is socially and economically better than she now is, we must build ourselves up, we must develop a good physique, build up a hygienic conscience, and free ourselves from social prejudices. Youth is said to be reckless, daring, enthusiastic, free from the burdens of life, free from care of the future, and indifferent to obstacles, if it has a mind to accomplish a set purpose. The present age is pre-eminently the age of youth. All great national regenerations of the present day are due to the revolt of youth. When young men all over the world are forming themselves into organizations with a set purpose of reforming themselves and society, why should we in India keep quiet?

Why has India come to this fallen state? It is because the educated men left all industries and agriculture in the hands of their poorer brethren. They have been selfish. They have not cared for the welfare of their own countrymen, the poverty stricken, starving masses of India,

who represent the real India. They have not realized and do not realize that they are born into a world which they can do much to improve, that there are millions of their countrymen who live in poverty, whose condition can be ameliorated if only they, the richer middle classes, try to do something for them.

The millions of India live amidst filth and dirt. The Indian ryot, though he has got a high sense of personal cleanliness, has very little sense of public cleanliness or what may be called public hygienic conscience. He does not realize that drinking water is a source of very many diseases and does not take care to boil it or get pure water. He leads a hygienically miserable life and dies a premature death. This is the condition of the untouchables. Is it not shameful for the nation as a whole to put aside $\frac{1}{6}$th of its population as untouchables ? Who is to rescue them from such a state of degradation and poverty ? Certainly, it is the educated men, the so-called higher classes who ought to do it. But the older generation will not do it as it has sunk so deep in the mire of caste prejudice and has not the courage to tear itself away from a tyrannical tradition for working for the uplift of a section of humanity. So, we, young men, who have not drunk so deep the poison of caste prejudice should do it. Why then, don't we do it ? It is not due to loss of sympathy for them but it is due to indifference. Let us shake off that indifference and be up and doing. Let us join together into associations in all parts of our country, wherever four or five of us can meet, meet often, discuss ways and means and carry out effectively a campaign against rural insanitation, social inequalities and illiteracy. Let us try to start Co-operative Societies, Agricultural Associations, encourage cottage industries and by extensive propaganda popularize the products of these industries amongst the higher classes. Let us learn and then teach others to maintain sanitary conditions in their stables and farm yards, in the preparation of ghee, in the handling of milk and other similar products. Let us avail ourselves of the help that Rural Reconstruction Societies or centres like those of the Y.M.C.A. can give us and co-operate with them and popularize such industries as apiculture and poultry-keeping. Let us also avail ourselves of the help that the Labour and Health Departments can give us and help them in spreading public hygienic conscience amongst the people. We, the students of the Agricultural College, in particular, have a splendid opportunity before us to help our country in this matter. Our work lies amidst people who live in the villages and by the training we receive in the Institution we are specially equipped to undertake work connected with rural uplift. If we do this the day will not be far off when we will have a new India, an India teeming with life and activity, an India free from social inequalities and economic distress.

We are now in the transitional stage in the political, economical and social field. Established traditions and customs are in the melting pot. This is the time for us, young men, to wake up from our long slumber and play our part in the social and economic regeneration of our country and bring her to the forefront among the nations of the world. Let it not be said that the Indian youth lagged behind when youths of other nations organized themselves and reformed societies and nations. Let us co-operate, organize ourselves into societies and leagues and work for the uplift and regeneration of rural India. May God make us realize our responsibilities, our duty to our country and help us to fulfil them.

THE MADRAS AGRICULTURAL STUDENTS' UNION AND ITS JOURNAL

A RETROSPECT AND AN APPEAL

By Rao Bahadur M. R. RAMASWAMI SIVAN, B.A., D.A.,

Retired Principal, Agricultural College, Coimbatore.

I deem it a privilege to be asked to make this appeal to our enlightened readers, especially to our Old Boys and the officers of the Department. I have been connected with the Madras Agricultural Students' Union from its inception and with its Journal as its first editor. I have been watching the growth of the Journal as an organ of the Union from year to year until now. It is a child for whom I have the most tender affection, and I would be most proud and happy if the Journal should be even more successful that it has been so far, in its get-up and appearance, its contributions and general news, its circulation and finance.

The Saidapet College and the Saidapet Farm—the scenes of the labours of the earlier pioneers for over 30 years in the field of agriculture and agricultural education, Robertson, Benson, Subba Rao and Krishna Prabhu—to name only a few—were ordered to be closed in 1907, and the new college was opened at Coimbatore in 1908, with a broader outlook, greater facilities, better equipment and a more suitable variety of soils for farm operations. The old Saidapet men continued to man the new college and the newly opened farms. With a view to keep the old and the new in close touch, for their own good and for the cause of agricultural progress in general, and also with the object of keeping the older *Alma Mater* in affectionate memory, an Association was formed in 1909, with the name of the Madras Agricultural Students' Union, membership to which was open to the old students of Saidapet, the present and old students of Coimbatore and the officers of the Agricultural Department. There was some tussle in earlier years whether officers who were not old students should hold offices, but, in view of the substantial help received from such officers, the restriction was gradually removed, so that all those connected with the Agricultural Department were later on declared eligible to hold, and have actually held, all the offices of the Madras Agricultural Students' Union. This is as it should be.

We also had a provision that persons other than old students, interested in agriculture, like Zamindars and distinguished scientists may be invited to be Honorary Members. They were not called on to pay any subscriptions, but most of them gave donations to the Permanent Funds of the Union. A later rule provided for the admission of Patrons who contributed not less than Rs. 100 to the Union Funds. The generality of members paid, however, a sum of Rs. 5 or Rs. 10 as life subscription. The idea of the Permanent Fund was that it should not be drawn on for the annual expenses of the College Day or for meeting deficits in the running of the Journal. There were special contributions for the Building Fund, and it was in contemplation that the Permanent Fund, which was expected to expand with the admission of new students in the college and the enlistment

of additional members year after year, should be utilized for advancing loans to deserving old students to prosecute their studies abroad.

The Madras Agricultural Students' Union took over from the Students' Club the duty of celebrating the College Day from 1910 and organized the Agricultural Conference from 1911. These conferences, though organized by a Students' Union, came to be recognized almost as Provincial Agricultural Conferences, both by the Heads cf Departments and by the general public, including the Press. This recognition was due to two main causes:—first, they were presided over by the most distinguished persons of the time, Executive Council Members, Ministers, Zamindars, Scientific Experts, Heads of Departments, up to His Excellency the Governor of Madras; secondly, the papers contributed to the Conference and the lively discussions which followed the reading of the papers were of a high standard, based as these were on the results of patient researches, careful observations and actual experience.

To keep up communication between the Agricultural College and Research Institute on one side and the landlords and executive agricultural staff in the districts on the other, it was felt from the very beginning that a Journal was absolutely necessary as an organ of the Madras Agricultural Students' Union. The *Year Book* started in 1910 blossomed into a quarterly publication next year, which developed into a monthly in 1914 all at the ridiculously low subscription of Rupee One per annum.

The original understanding was:—(1) that every one eligible to join the Union should join it; (2) that every one, including the Editor, should be a subscriber to the Journal; (3) that the staff at Coimbatore should send contributions on the educational and research work in progress and also on all matters pertaining to the Estate, including the Officers' Club. (4) that the District Agricultural Staff should send then and there, copious notes based on the results of experiments conducted at the Agricultural Stations and also on the agricultural enquiries made by them during their constant tours and (5) that the present students should contribute notes on the activities of the Students' Club, athletics and games, including details of matches and tournaments—cricket, hockey, football and tennis,—students' excursions and observations made by themselves on the Central Farm and elsewhere.

While the original idea of the founders was that the Journal as an organ of the Madras Agricultural Students' Union should essentially be a 'College News', they laid stress at the same time on the necessity for actual experiences and personal observations being recorded in the Journal, in preference to general platitudes and to information almost gathered from lecture notes.

As time advanced, the scope of the Journal enlarged with the result that it is now not only College News but an agricultural Journal catering to the larger public interested in agricultural development. The higher cost of paper and printing prevailing in recent years necessitated the revision of subscription, and I believe that no one will complain that the present annual subscription of Rs. 4 is too high. May I mention that, with the present subscription and with the small number of subscribers, some of whom are in arrears, it is becoming more and more difficult to run the Journal as a self-supporting concern.

Time was when some heads of offices did not care to help the Union or Journal directly and probably even resented their subordinates writing

to the Journal. The present Director of Agriculture takes such a keen interest in the Journal that, as I understand, the question was seriously considered whether the Department might not take over the management of the Journal but the Working Committee seems to have decided—and, I may say, decided correctly—that the Journal should not be made quite official. So long as the Madras Agricultural Students' Union is in existence, it is essential that it should have an organ of its own. The Director appears to have promised to help the Journal so far as contributions are concerned, by asking Heads of offices and their subordinates, both scientific and executive, to send articles to the Journal in lieu of articles to the Year Book of the Madras Agricultural Department. The symposiums on particular crops to which contributions are made by the Agriculturist, the Chemist, the Plant Breeder, the Mycologist and the Entomologist, are a particular feature of recent Agricultural Conferences, and we are indebted to the Director for these symposiums. We are also glad to note that the several scientific experts and agricultural officers realize, more than ever, that a *real*, and not nominal, co-operation of all the staff is essential for agricultural progress.

It has to be borne in mind that the Editor, the Sub-Editor, the Manager of the Journal and all the members of the Managing Committee at Coimbatore are full-time Governmnet officers and that they have to devote time, outside their office hours, to do the work connected with the Journal. It follows, therefore, that greater improvement in the Journal, both in get up and matter, will be effected, to the extent that other members of the Madras Agricultural Students' Union help the Editorial staff at Coimbatore. Fortunately, the long delays in the issue of the Journal are things of the past and we have to congratulate the staff on the punctuality of the Journal.

I claim your indulgence for making this appeal to you, as an old teacher of most of the Old Boys, as a late colleague of all the officers of the Department, as a friend of several landlords all over the Presidency and, as I said above, as one of the Founders of the Madras Agricultural Students' Union and its Editor for a time; I expect you will construe this appeal in the only spirit in which it is offered, namely, to increase the usefulness of the Union and to assure the financial success of its Journal.

Search year hearts and say whether you have done all you can to promote an *esprit de corps* amongst its members—the spirit of service and comradeship. That is what the Madras Agricultural Students' Union stands for.

Have you cherished, and are you cherishing, the grateful affection for your *Alma Mater*, for all the good she has done you and for all the success which you have had in life, as a result of your education at the College?

Have you joined the Union as a member and have you persuaded all your friends to join, who are eligible to become members but who have kept themselves aloof so far?

Are you subscribing for the Journal? If not, why? The mere fact that you are able to read the Journal in the College library or your office is not an argument. Realize that, as an Old Boy or as an officer of the Department, you have to subscribe for a copy yourself, irrespective of how many copies have been subscribed for by your office or by other members, whose copies may be available for you to read.

Are you getting new subscribers to the Journal? Are you bringing the Journal to the notice of the landholders and other possible readers whom you meet in your constant tours? If you have not done so until now, will you please do so hereafter?

Are you contributing to the Journal? Do not say that you have no particular matter to send. You have had a good education in agriculture and the allied sciences. You are having plenty of facilities, whether you are in the scientific or agricultural line, to learn and to observe. If the officers of the Agricultural Department of all ranks are unable to send contributions to an agricultural Journal, who else can do it? No agricultural officer can plead inability or incompetence. I contend that you are all qualified, very well qualified and more qualified than any other, to contribute articles on actual experiences and actual results. What is wanted is to cast off inertia and set to work. Long, erudite articles take much time and are not even so much in demand as short, pithy notes. Do not wait for an accumulation of matter, but send on to the Editor every note, however short it may be, then and there.

I know that the talented staff on the Managing Committee and on the Editorial Board at Coimbatore can look after their work without any intermediary and that they are seeing to it that the Journal is improving in quality and is issued more regularly than ever before. I felt it, however, my duty, as one so long and so closely connected with the Union and with the Journal, to ask like Oliver Twist for more.

FARMING CALENDAR FOR THE COIMBATORE DISTRICT

January

1. This month marks the beginning of the dry weather period. Rainfall is usually below 1 inch. The days are for the most part bright and clear, and the mornings are cold and dewy.

2. Grain cholams late sown are harvested and prepared for the market along with the harvest of this crop in the previous month.

Red gram and horse gram are gathered. Black gram and green gram in the red soils near the hills are harvested and made ready for the market.

Dry cottons receive the last hoeing with mammutty. Bengal gram highly benefitted by the dewy weather of this month develops well and approaches maturity.

3. Irrigated cotton (Cambodia cotton) is in full flower and bolls, and stray pickings commence in the latter part of the month. This and tobacco receive irrigation.

Early tobacco is harvested and cured. Late tobacco-suckers and shoots are regularly removed from this crop.

Chillies-fruits are gathered and cured. Sugarcane is harvested in parts, and preparation of the land intended for planting fresh cane is hastened.

Plantains receive a good hoeing and manuring either with leaf manure or tannery refuse and copious irrigation is given to this crop. In parts again plantains (*Thai Vazhai* தை வாழை) are just started. Planting of this crop in the month is specially done in order that the crop when in full bearing may escape the high winds of the South-West monsoon.

Turmeric is harvested in the Erode-Bhavani valley. It is an interesting sight to see the turmeric growers in this tract busily engaged in boiling, preparing and cleaning the turmeric for the market.

In places in this district an early irrigated variety of cholam (white) called 'Thai cholam' ('தைவெள்ளை') is raised.

Special crops like cumin and garlic in and near Udumalpet are harvested and gathered in.

4. In the river valleys paddy is harvested, threshed and got ready for the market. In some places like Erode, preparation of the land for raising a short duration crop of paddy is in progress and a few fields are even planted to this crop.

5. Besides, patches of kitchen gardeners' cultivation are also in evidence in villages near towns—both in garden lands and favourably situated high level wet lands. In tank beds, cultivation of cucumber varieties, watermelons and the small type of bitter gourd (குழிப்பாகல்) is started.

February

February is typical of the dry weather period. The mornings continue to be cold and dewy. Bright sunny days prevail throughout the month. Rainfall is practically nil. Average is about half an inch or even less.

2. Bengal gram is harvested. Cotton picking in the dry lands begins.

3. Preparation of the fields for the coming summer cholam is busily going on. Manure is carted. Tanks being dry this month, silt is carted regularly to the fields as ryots are not otherwise busily engaged.

Sheep are penned in garden lands. Unlike in some of the Southern districts flocks of sheep numbering about 200 or so are penned in enclosures which are shifted daily. This results in intensive manuring of garden lands.

Fields are prepared and good tilth is obtained for sowing irrigated cholam. Often lands are moistened to obtain soil conditions for ploughing. This results in the preparation of a nice seed bed. Moistening the fields before ploughing is known as 'சேடைகட்டுதல்'.

Gathering of the Cambodia kapas is in full swing. Late tobacco is harvested and cured. Chillies are gathered and the harvest finishes in this month.

Sugarcane is planted in a few localities. This planting is known as 'சோடைகட்டுதல்'. Necessarily along with this planting, jaggery manufacture is also in progress.

4. Late planted paddies are harvested and threshed. Under the Bhavani channel in Erode Taluk, a short duration variety of paddy is transplanted as a thin crop in the fields.

Plantain bunches in fields planted to Thai Vazhai (தைவாழை) of the previous year are gathered.

Being usually a slack period farm labourers are engaged in preparing fibre from aloes, gogu (புளிமஞ்சு) repairing live fences, cutting and composting prickly-pear, collecting and carting fuel for domestic use and hiring out of cattle pairs for transport of grains to and from shandies, and building materials for house builders.

T. V. R.

CARE OF THE DAIRY COW OR BUFFALO AT CALVING TIME [1]

The cow nearing parturition should be cared for and fed in such a way that she will calve easily and normally, recover rapidly from the effects of calving and start her lactation period in good health. Proper management at this time means more living calves, fewer sick cows and better chances for a longer period of greater milk and butter fat production.

Care before calving.—The cow nearing parturition should be taken in hand six to eight weeks before date of calving, it must be kept with other cows in a like condition and grazed or exercised separately from the whole herd. She should be housed in a roomy box stall, about 10 feet square is large enough, and if room permits, a small exercise yard adjoining. See that the cow does not injure herself by slipping in the stable floor, which should have a rough surface, and that she does not crowd through doorways or at the water tank. If the cow due to calve is allowed to run with the herd, there is a possibility that it may mount other cows in heat and slip and injure herself, so keep her separate from the main herd. The loose box should be kept clean and disinfected and a good bedding of hay or paddy straw put on the floor in order to make the cow comfortable; in this manner she will accustom herself to her new surroundings before the time of calving. Cows nearing parturition should be given plenty of exercise and not tied up all day long. Graze her separately in a small paddock.

Wash and groom the cow frequently, handle her every day so that she gets used to you and she will be gentler and easier to milk after calving.

Feeding before calving.—During her dry period, feed her on a maintenance ration of 3 to 4 lb. per day of concentrated food according to her size (2 lb. groundnut cake and 2 lb. wheat bran). Six weeks before calving, increase this gradually to 6 lb. concentrated feed. 2 lb. cake, 1 lb. dholl husk, 2 lb. wheat bran, and 1 lb. rice bran *plus* 15 lb. green grass or fodder or silage and 10 lb. hay. This assists the cow to be in good condition at the time of calving, a stronger calf is produced and it leads to increase the flush of milk after calving. The cow is thus able to stand the strain of calving better than if she is in a weak condition. Keep the cow warm and if she is constipated, give her a bran mash (made of warm water and wheat bran), also a dose of Epsom Salts, say $\frac{3}{4}$ lb. in warm water.

[1] Adapted at our request by Mr. R. W. Littlewood, from an article in the *Tropical Agriculturist*, October 1930. ED. *M. A. J.*

Care during calving.—Leave the cow quiet to calve naturally. Do not disturb her. Watch her condition however from time to time. After she has laboured an hour or two, have an examination made by an experienced person to determine whether the calf is in normal position, which is nose and front feet foremost with the front feet alongside the head. Usually the calf is in this position, and the cow is able to expel it without much difficulty. If the calf is not in this position however, it can sometimes be pushed back into the womb and turned so that it may be presented normally. Before attempting this, wash the arms and hands carefully in a disinfecting lotion and oil the hand and arm well before inserting it into the womb to explore. If it is evident, after 2 or 3 hours of straining that the cow is going to calve with difficulty, steps should be taken to help her. In order not to injure the cow, call in a Veterinary Doctor or an experienced person to attend to her at this time.

Care of the new-born calf.—Give the calf attention as soon as it arrives. Sometimes a slimy membrane covers its nose; remove this at once and blow down the nostrils so that the calf breathes easily. Usually the cow will dry the calf by licking it vigorously. If she does not do so, dry the calf with a wisp of hay or straw or other suitable material. Soon the calf will attempt to rise and in half an hour it will be suckling. If it is weak and unable to stand and suckle, hold it to the cow's udder. ALWAYS give the calf the first milk (colostrum), this is very beneficial in cleaning out the system and in aiding the organs to start functioning.

To prevent navel troubles such as navel ill, etc., apply tincture of iodine to the calf's navel *immediately* after birth. If the cord attached to the navel is long, cut if off about an inch from the body after tying it with a ligature above and apply iodine.

Care after calving.—Just after calving, the cow is in a weakened condition and her digestive system is sluggish. She needs little nourishment but should be kept warm and comfortable. It is a good practice to give her a warm douche, such as Epsom Salts (12 oz.) and a little ginger and give her lukewarm water to drink. Feed her for the first day on warm bran mashes (wheat bran). Thus cared for, she should be able to expel the afterbirth normally within a few hours after she has calved. If it is necessary to leave the cow alone, tie her up so that she cannot reach the afterbirth after it has been expelled. Remove it from the stall as soon as possible.

If the afterbirth is not expelled naturally within the first 48 hours, its retention is usually due to inflammation of the womb. Call in a Veterinary Doctor and obtain his help, for it may be followed by or induce barrenness.

Milking.—The time of the first milking will depend on the condition of the udder. Usually it will not be necessary to milk the cow for about 12 hours after she has calved. And then, only part of the milk should be drawn and the rest left for the calf.

Milk Fever.—Milk fever generally attacks mature cows and usually occurs within 2 days after calving if it does occur. It is usually heavy milkers which suffer from this and the present Indian cow is not likely to suffer from this. It may be recognized by a staggering gait and lack of control of the hind-legs. As the disease progresses, the cow goes down in a stupor, lying in a natural position, except that the head is usually turned

towards the flank. Later, paralysis may become general, and then the cow lies on her side. Treatment should be given promptly and a Veterinary Doctor called in at once with a special milk fever outfit. Sterile air is pumped into the four quarters of the udder and tape tied round the teats to prevent the air from escaping for 3 hours or so. After 3 hours, remove the tape and massage the teats. Usually one treatment is sufficient. It is generally effective.

Congested udder.—If the cow is at all feverish or the udder hard and congested, give a douche of 1 lb. dose of Epsom Salts. If this does not have the desired effect, give a second dose later. Leaving the calf with the cow for a few days may help. The calf's frequent sucking and massaging of the cow's udder seem to aid in lessening the congestion. In persistent cases, milk the udder 3 or 4 times daily, bathe with warm water, thoroughly dry the udder and massage it and then apply camphorated oil to the affected quarters. Keep the cow indoors out of drafts.

Feeding after calving.—Give her plenty of succulent fodder or green grass and feed her with concentrated food according to her milk yield. If giving 15 lb. milk a day, give her 8 lb. concentrated food. (2 lb. cake, 2 lb. cotton seed, 2 lb. dholl husk, and 2 lb. bran.) Increase this gradually if her yield increases. The cow will gradually give more milk each day up to the 5th or 6th week when she will reach her maximum and remain about that amount for a time.

Notes and Comments

Rao Sahib Y. Ramachandra Rao mobilized against locusts.—Our readers are doubtless aware of the great damage to crops that resulted from locusts during the last season. The destruction was so considerable and involved so many provinces that it had to be tackled as an all-India problem and by the newly created Council of Agricultural Research, who lost no time in calling into being a special 'Locust' committee to deal with the menace. This committee which consisted of experts and persons with first-hand knowledge of the new scourge soon found that the only way of satisfactorily dealing with the problem was the creation of a special staff to explore the breeding places and study the life history and habits of these uncanny visitors. It is in connection with this investigation that our Rao Sahib has been called to the Frontier with headquarters at Quetta; and he relinquished charge of the office of the Government Entomologist at Coimbatore on December 12.

We have not seen a live locust ourselves nor are we anxious to see such a one in our Presidency. It has been a declared enemy of mankind from Biblical times and has frequently been styled—not undeservedly as a veritable 'plague'. To a layman it might well be described as a large grasshopper. To put briefly, the object of the present investigation is to locate the chief breeding places of the pest and try and destroy them before the pest gets a chance to multiply or discover the vulnerable points in its life cycle and devise suitable destructive measures.

During his long connection with entomological work in our Presidency—now well nigh two decades—this is the third time that our Rao Sahib thus goes out on deputation. The first was during 1916 and 1917 in connection with the natural pests of the 'Lantana', an ornamental but dangerous weed. His second deputation was during 1919 and 1920 to initiate and organize entomological work in the country between the two rivers—Euphrates and Tigris—the then not very settled country of Iraq. On both the occasions he did the work entrusted to him with such zest and application that we are not surprised at his being thus deputed a third time.

Two of these missions—it will be readily seen—are of an all-India nature and, in every one of the three cases, the field for selection has been on an all-India basis. It is a distinct compliment to our Presidency and to the staff of our Department of Agriculture that the Rao Sahib should have been selected on all the three occasions.

The Irrigation Board.—We understand from the *Hindu* of November 25, 1930, that Government have appointed an Irrigation Board, to examine forthwith, irrigation projects held to have been a failure in the past, and to take measures for the removal of obstacles to their development. Styled as the Irrigation Development Board, it will consist of the Commissioner of Land Revenue, the Commissioner of Land Revenue and Settlement, the Chief Engineer for Irrigation, and the Director of Agriculture. The heads of departments directly concerned will also be members,

and the senior of the two Members of the Board of Revenue will be Chairman, who is empowered to call in the head of any other department for consultation.

The institution of this Board is a step in the right direction and will remove a long-felt need for an authorised body to examine all avenues for developing irrigation projects as rapidly as possible to the greatest possible advantage of the ryot. We wish the Board all success and trust that ryots will welcome it and derive advantage to themselves, by supplying information and rendering all possible assistance to the Board.

The Indian Science Congress.—The 18th session of the Indian Science Congress meets on the 3rd of this month at Nagpur under the presidency of Lt.-Col. Seymour Sewell, of the Zoological Survey of India. Sir T. Vijayaraghavachariar, the Vice-Chairman of the Imperial Council of Agricultural Research, presides over the Agricultural Section. We understand that one morning session of the Agricultural Section is to be devoted to discussions on Plant nutrition and Soil requirements jointly with the Botanical Section.

Messrs. G. N. Rangaswami Ayyangar, K. Ramiah, Dr. T. V. Ramakrishna Ayyar and Rao Bahadur B. Viswa Nath are attending the Congress from our department.

Study Leave.—We have received a communication from the Director of Agriculture, Madras, enclosing extracts from two letters received by him, from the Directors of the Imperial Bureaux of Plant Genetics and of Agricultural Parasitology, England. These extracts refer to the recent report of the Executive Council of the Agricultural Bureaux, about study leave facilities for research workers from abroad. The Directors are offering all assistance in their power in regard to any research workers from our country who may shortly be contemplating a course of study leave. Being in touch with institutions both in the Empire and foreign countries, the Directors are in a position to give suitable advice and information, and we trust that our readers and others will take advantage of the offer.

Our Journal.—From January 1931, our Journal changes its garb and will appear with a new cover design. The old cover paper, with its College buildings, and picturesque details of agricultural activities, gives place to a plain wrapper simple in design, which we trust will be more in keeping with a quasi-scientific monthly whose object is the propagation of plain truths and facts of observation and research.

Board of Studies in Agriculture and Sciences.—We understand that the following Board of Studies in Agriculture has been constituted by the Syndicate of the Madras University, to take effect from December 16, 1930 and will hold office for 3 years ;—

Messrs. R. C. Broadfoot, G. R. Hilson, C. Tadulingam, Dr. T. V. Ramakrishna Ayyar, H. Shiva Rao, S. Sundararaman, G. Nagaratnam Ayyar, V. Krishnamurthi Ayyar, Dr. N. Kunjan Pillai, I. Raman Menon, and Rao Bahadur M. R. Ramaswami Sivan.

Rao Bahadur B. Viswa Nath, Mr. S. Sundararaman and Dr. T. V. Ramakrishna Ayyar have been appointed members respectively of the Boards of Studies in Chemistry, Botany and Zoology of the University of Madras.

University Lectures.—Mr. G. N. Rangaswami Ayyangar, has been chosen by the Syndicate, we understand, to give a course of six University lectures to the B.Sc., (Ag.) students on Plant Genetics.

Flood Relief.—Elsewhere in this issue, we publish an appeal from Mr. K. Ambikacharan, for relief to the sufferers. The havoc caused by floods and storms throughout the presidency has been phenomenal and thousands have been rendered homeless and destitute. In many parts standing crops have been washed out by the floods leaving desolation and misery in their wake. We commend Mr. Ambikacharan's letter to all our readers and to their sympathy and generosity.

Honorary Visitors to the Agricultural College.—The following 25 gentlemen have been appointed as honorary visitors to the Agricultural College and Research Institute, for a period of 3 years to take effect from the December 1, 1930 :—(1) Rai Bahadur Tadapalle Venkatakrishnayya Pantulu, (2) Mr. C. Sudarsana Raju, (3) Dewan Bahadur C. Venkatachalam Pantulu, (4) Rao Sahib K. Chitti Abboy Naidu, (5) Sri Raja Sobanadri Appa Rao Bahadur, Zamindar of Telaprole estate, (6) Mr. J. Kuppuswami Chowdari, M. L. C., (7) the Hon'ble Mr. B. Ramachandra Reddi, B. A., M. L. C., (8) Mr. Thammi Reddi, Adoni, (9) Mr. G. Lakshmana Reddi, Anantapur, (10) Mr. B. P. Sesha Reddi, M. L. C., Kurnool, (11) Mr. K. Koti Reddi, M. L. C., (12) Dewan Bahadur G. Narayanaswami Chetti, (13) Dewan Bahadur C. Arunachala Mudaliar, Zamindar of Chunampet, (14) Rao Sahib Kolandavelu Udayar, (15) Mr. K. Z. Venkatapathi Nayani, Zamindar of Kangundi, (16) Mr. N. Ranganatham Naidu, (17) Rao Bahadur K. S. Venkatarama Aiyar, Negapatam, (18) Mr. G. Rajagopal Pillai, F. R. H. S., (London), Bhikshandarkoil, (19) Mr. K. R. Venkatarama Aiyar, M. L. C., (20) Mr. A. K. D. Dharmaraju, (21) Mr. M. D. T. Ranganatha Mudaliar, M. L. C., (22) K. Uppi Sahib Bahadur, M. L. A., (23) Mr. A. B. Shetty, M. L. C., (24) Mr. A. Ramaswami Naidu, (25) Mir Mahomed Kalimullah Sahib Bahadur.

Sugar Technologist.—We are glad to learn Mr. R. C. Srivastava has been appointed by the Imperial Council of Agricultural Research, as Sugar Technologist. He will have his headquarters at Cawnpore and besides advising promoters of new sugar factories, will also carry out experimental work with the object of improving indigenous methods of jaggery and sugar manufacture. This, we note, is in accordance with a resolution of the Governing Body of the Imperial Council of Agricultural Research [*Vide M. A. J., January, 1930*, page 22].

Prize for Bone-crusher.—The Imperial Council of Agricultural Research has offered a prize of Rs. 3,500 for the best design of bone-crusher to be run (1) by cattle power, and (2) by engine power. The competition is open to all individuals including Government servants, provided the latter get the permission of the authorities. We are sure that there will be many amongst our members and readers with a mechanical turn of mind, who will be able to evolve a suitable design, that while it wins the approval of the Imperial Council, will incidentally assure the establishment of several bone-crushing factories in all parts of the country and thus enable the ryot to get the phosphoric acid for his lands at a cheap cost.

For details of the competition, a reference might be made to the Secretary, Imperial Council of Agricultural Research, Delhi.

Gleanings

Food Value of the Orange.—Orange should have an important place in the diet. Although a flavour fruit which stimulates the appetite, the orange has an actual nutriment value of 240 calories to the pound, due principally to its high sugar content. This fruit sugar which is an energy-giving food, is in a form easily digested and assimilated by the body. In addition, the orange contains a small quantity of protein, the muscle-building food element, and a high proportion of valuable mineral salts and acids. These minerals are particularly important, since they are not found in some of the foods of which we commonly eat large quantities such as meats, white rice, potatoes, white bread and sugar.

While known as acid fruits, oranges are often prescribed in cases of acidity. This is due to the fact that these fruits have an alkaline reaction after digestion, and thereby counteract acidity. Orange juice is rich in vitamins, important factors in the prevention of disease and regulation of body processes. Orange juice is a regular part of the diet of young babies, and supplements the vitamin deficiency sometimes found in milk, making a complete and perfect food for the young child.

—*Farming in South Africa*, October 1930.

Arid Land Farming.—Present-day irrigation and dry farming constitute, in a way, a return to the ways of our earliest civilized fore-bears. Civilization originated in the semi-arid lands of the world, and only after the lapse of centuries did farming leave such places as the valleys of the Nile and the Euphrates and reach its greatest development in the moister, cooler lands of the temperate regions. Now we are again paying attention to the lands of little water, using methods that are basically the same as those of the earliest farmers but with the advantages and improvements that can be derived from modern science.

This is one of the points brought out in a review of principles and methods of soil utilization, presented at the Second International Soil Science Congress, meeting in Leningrad, by Sir John Russell, head of the great agricultural experiment station at Rothamsted, England.

The two principal means of gaining a profit from warm lands of little rainfall, Sir John pointed out, differ radically in their methods and results. The first, which dispenses with artificial watering, devotes itself mainly to the support of grass crops either as grazing lands producing mainly wool, or as dry-farming areas producing cereals. The second which uses irrigation, is too expensive for staple food production except in such lands as Egypt, where the object is more to keep the population alive than to realize profits. Elsewhere irrigated lands are given over primarily to specialized, high-price crops, such as fruits.

The soil problems of dry-farmed lands are quite different from those of the humid regions. In ordinary farm lands organic matter in the soil is counted indispensable; it is not found so in dry-farmed lands. More than 25 per cent of clay in a moist region condemns land as untillable and consigns it to the category of permanent pastures. In arid regions the

clay content may run as high as 50 per cent without destroying the tillability of the soil. Nitrogenous fertilisers are not so necessary on dry as they are on moist lands, but sulphur and sulphates are more effective.

'Considerable success has already been achieved on these soils' said Sir John. 'Much of the world's wheat and wool is now grown on them, and there is distinct promise for the future.'

—*Science Supplement*, September 12, 1930.

Spray paper mulches to aid crops.—The use of mulch paper for covering the fields between furrows in order to help the soil retain moisture and to prevent the growth of weeds has been described previously in these columns. An interesting variation of this new idea is being tried out in Germany. Instead of covering certain crops with paper sheets, as is customary in America, a paper coating is sprayed on the fields.

The action of paper coverings results in many cases in a greatly increased production of certain crops, because the soil temperature is increased, weeds suffocated, pests destroyed and the soil bacteria activated. The paper spray is said to be cheap, cannot be removed by the wind, and is not dissolved by rain. Its most obvious advantage over the use of paper in sheet form is its ease of application. What the effect on the growing will be has not yet been determined.—*Scientific American*, November 1930.

Asbestos inflammation of the lungs.—While the asbestos industry is more than 2,000 years old, it has only within the past few years taken a prominent place among the great industries. With the development of the industry, physicians have begun to notice cases of extensive fibrous changes in the lungs due to the inhaling of the asbestos particles and the inflammation of the lungs set up by the particles. When the material is taken into the lungs, it can be found in the tissues in the form of black particles. Similar particles are to be found in the sputum of the patient and indicate to the physician the source of the disorder. Drs. K. M. Lynch and W. A. Smith have described several cases in which these asbestosis bodies were seen in the sputum when the sputum was studied under the microscope. By the use of proper stain methods, they are given prominence. Thus there is provided for the scientific physician who is confronted with such a case a certain method of diagnosis.

—*Scientific American*, November 1930.

Drought Resistant Canes.—The Hawaiian Sugar Experiment Station has made an investigation of the juices of seven varieties of sugarcane in which the freezing point and osmotic concentration of each of the varieties were determined. On examining the figures it is seen that there appears to be a correlation between the freezing point of the juice and the resistance of the variety to drought. Cuba cane is without doubt the most drought-resistant cane variety in Hawaii and it has the lowest freezing point and highest osmotic concentration of the varieties studied. Lahaina cane, the juice of which is easily frozen and has a low osmotic concentration, is without question very sensitive to drought.

—*Facts about Sugar*, September 1930.

Correspondence

I

We have received the following from the Statistical Assistant to the Director of Agriculture, Madras :—

Coconut Prices in India

To

The Editor, Madras Agricultural Journal,

I.—INTRODUCTION

The world's marketed production of coconuts, copra, and coconut oil, reduced to one common denomination, namely coconuts, is estimated at 7,374 million coconuts on the basis that one ton of nuts equals 1,400 nuts, one ton of copra equals 5,000 nuts and one ton of oil equals 8,125 nuts. Details are given below :

TABLE I

MILLIONS OF NUTS EXPORTED

Locality	*As nuts.*	*As copra.*	*As oil.*	*Total exported.*
Dutch East Indies ...	N	2,191	255	2,446
Philippines ...	N	1,154	1,137	2,291
Ceylon ...	18	494	317	829
British Malaya ...	9	558	60	627
Fiji ...	N	342	N	342
New Guineas ...	N	230	N	230
India (mainly West Coast).	N	½	2½	3
Total ...	27	4,969½	1,771½	6,768
Other countries ...	38	563½	4½	606
Grand Total ...	65	5,533	1,776	7,374

N—Nil or negligible.

It is seen from the above that Ceylon copra which bears the highest price next to Malabar bears but a small proportion to the total quantity marketed and that exports of the high grade Malabar copra have practically ceased.

II.—THE DECLINE IN THE PRICE OF COPRA

In the Philippines which ranks the second as an exporter of copra and first as an exporter of coconut oil, the price of copra in 1929 was 21 per cent below that in 1926.

The price of Straits copra also has been declining since 1925 as shown by the following figures:—

TABLE II

AVERAGE PRICES (C.I.F., LONDON) FOR STRAITS COPRA, TAKING THE 1925 INDEX PRICE AS 100.

Year	Price
1925	100
1926	95
1927	91
1928	89
1929 (November)	77
1929 (December)	74

c.i.f. = cost including freight.

The drop in the Singapore prices for sundried copra has been marked month by month in 1930. Taking January 1930 index price as 100, the price in the succeeding months is shown in the table below.

TABLE III

SINGAPORE PRICES IN 1930, TAKING THE INDEX PRICE OF JANUARY 1930 AS 100.

Month		Prices
January	1930	100
February	,,	99
March	,,	95
June	,,	89
July	,,	83
August	,,	76
September	,,	70

III.—REASONS FOR THE DECLINE

The fall in the price of copra must be attributed to a number of causes given below:—

(1) The activities of a combine of crushers which is said to control the European market to a great extent (especially in edible oils.)

(2) The rapid increase in the world production of other edible oils especially groundnut. While the world exports of copra and groundnut before the war were nearly the same, the exports of groundnut

are now much greater than those of copra as shown by the latest available figures given below :—

TABLE IV

WORLD EXPORTS OF COPRA AND GROUNDNUT (IN THOUSANDS OF TONS).

Article		World exports in 1909–1913 (Average)	1925	1926	1927	1928
Copra	...	545	907	1,008	913	1,080
Groundnut	...	555	1,333	1,377	1,304	1,595

(3) *The strong competition of the whale oil industry.* The production of whale oil increased from 109,000 tons in 1922 to 226,000 tons 1928. Production in 1929 is expected to show a further material increase. Whale oil is in no way inferior to copra oil for margarine production. The whaling industry is well organized and the number of companies engaged in whaling has increased considerably. Whale oil at £25 per ton is said to give a profit to the producer of 25 per cent. At present copra oil is quite unable to compete with whale oil for edible purposes.

(4) The output of edible oils in the world having increased enormously the prices have had naturally to come down especially to induce the increased consumption.

(5) The present slump in glycerine has also had its effect on the price of oils and fats for the production of soap.

IV. COURSE OF PRICES OF COPRA IN INDIA

Fortunately till now, India has been slow to react to the fall in the price of copra in the chief markets of the world, mainly due to the fact that its export to other countries is comparatively negligible. But it could not escape the painful process of readjustment to world conditions and the inevitable happened this year.

V. PRICE OF COPRA IN FUTURE

It is not possible to state whether copra has reached its rock bottom price and whether there will be recovery in price though slow. This depends, in addition to the present world wide depression, on the future course of the groundnut and whale oil trades. The future planting of groundnuts is liable to fluctuation according to the trend of prices and the nature of the sowing rains. As regards whale oil, it seems reasonable to anticipate that the slaughter of increasing number of whales may soon affect the amount of oil available from this source, by reason of the decrease in their population.

LIST OF BOOKS CONSULTED

Malayan Agricultural Journals, 1930 (January, February, March, April, July, August and October).

The Philippine Journal of Agriculture, First quarter 1930, Volume I, No. 1.

II

Coconut Slump

To

The Editor, Madras Agricultural Journal,

Sir,

The slump in coconut business is due to the following reasons so far as is known to me.

(1) The increase in area of groundnut and groundnut oil and oil-cake taking the place of coconut oil and oil-cake for all purposes.

(2) The area of coconut in the world over extended very considerably just before the great war when the market was very encouraging for the products and as such the out put at present is considerably increased.

(3) The oil palm is another competitor for the coconut and the area under that has also increased very considerably.

(4) The combine of oil magnates in Europe to keep down the price.

(5) The general dislocation of the world trade caused by the various causes has had this influence on the coconut. The immediate effect of it has been that the money market has become tight after the recent great quash of the exchange boom in New York which drew from circulation much of the gold of the world and dislocated business.

(6) The special favour shown to the Philippine growers by the American merchants as Mr. Cherian Jacob has already explained it.

When the depression in the money market disappears a considerable part of the trade must be regained.

Yours truly,

K. Unnikrishna Menon.

III

Flood Relief

To

The Editor, Madras Agricultural Journal,

Dear Sir,

I will be much obliged if you can kindly publish the following lines in the valuable pages of our beloved journal.

Everybody, by this time, knows that the city of Madras and its suburbs have experienced a raging tempest of the severest type quite unknown to the inhabitants till now. The havoc it has played in rendering thousands of poor people homeless and deprived of food cannot but make one and all of us sympathisers of the sufferers. Much need not be written about the description of the affected parts which will be only a waste of time. What I would request all my brother officers of the Agricultural Department is that every one of us should subscribe his mite by rising to the occasion. I am quite sure and pray God that there can be no exception among us. The subscription may either be sent direct to the Secretary, Servants of India Society, Royapettah, or sent to any of the Relief Committees at Madras. Let us all pray to God that there should be no more worry to the poor sufferers and that the subscriptions from all parts of the country should swell by leaps and bounds and improve the condition of the affected people.

Yours sincerely,

K. Ambikacharan.

NOTES ON BOOKS RECEIVED IN THE LIBRARY

THE ARRANGEMENT OF FIELD EXPERIMENTS AND THE STATISTICAL REDUCTION OF THE RESULTS.—By R. A. Fisher, SC.D., F.R.S., and J. Wishart, D. SC.—*Imperial Bureau of Soil Science Technical Communication No. 10, Rothamsted Experiment Station, May 1930.* 24 pp.

This memorandum which originated at the instance of the Soil Bureau aims at explaining the broad principles underlying the plot technique of controlled random arrangement, i.e., randomized block and the Latin square. Appropriate illustrations from actual experiments with the description and actual working out of the arithmetical processes involved in the statistical reduction of data are clearly set forth. The method of analysis of the data are founded in the conceptions of Degrees of Freedom and 'Analysis of Variance' developed by R. A. Fisher, by means of which, the total variation in yield is correctly apportioned to (1) the variety or treatment, (2) soil integrity of blocks, and (3) the residue representing the random and uncontrolled field variation by which 'the real experimental error is calculated.' The publication will serve as a useful working guide to the field experimentalist—in variety and manurial trials—for the proper analysis and significance of yield variation.—[N. P.]

THE GRAIN-SHEDDING CHARACTER IN RICE PLANTS AND ITS IMPORTANCE.—By S. G. Bhale Rao, B. AG.—*Imperial Institute of Agricultural Research, Pusa, Bulletin No. 205. Price As. 12 or 1s. 3d.*

The voluntary grain shedding in the rice crop before harvest has assumed, a serious importance in the Bombay Presidency especially in the Mallad tract of Southern Division. The loss is estimated to be up to 30 per cent of the crop. The author traces the cause to the highly shedding wild jungle rices which grow profusely in shallow waters of the ponds and irrigation tanks. The occurrence of the numerous shedding wild forms or 'Gonags' contaminating the cultivated varieties in the field, is found to be the result of genetic combinations and reshuffling of character, due to the natural crossing of the jungle rices with the cultivated varieties. A full description is given of the jungle rices, with variations noted among them, and also of the 'Gonag', those resembling the wild parent and easily distinguishable from the cultivated forms and those which are difficult to be recognized from the cultivated varieties except in the grain shedding character. These 'Gonags' were studied by the author by growing the individual forms separately, and it was found that those resembling the wild forms bred true not only for grain shedding but also to other characters noted. And thus it is suggested that wild characters are recessive though it is not yet supported by sufficient data. The types which resemble the cultivated varieties were found to be always heterozygous for grain shedding and other characters as well.

Methods to control this problem aim firstly at the destruction of the wild rice at the very source, i.e., in the tanks and irrigation sources. The infection already present in the fields is warded off (1) by the adaptation of transplantation instead of drill sowing of the crop wherever possible, (2) summer irrigation of the rice fields to induce the self-sown 'Gonag' to germinate, followed by drying and harrowing, (3) by growing crops other than rice in rotation, (4) by leaving the field fallow for one season, (5) by hand roguing of the 'Gonag' to prevent fresh sources of infection, and lastly (6) to grow the non-shedding strains evolved at the Rice Breeding Station, Mallad.—[N. P.]

College News and Notes

Students' Club.—Dr. T. R. Seshadri, the Soil Physicist and Dr. J. S. Patel, the Oil Seeds Specialist, treated the members of the Students' Club, to two interesting informal talks, during the month. Dr. Seshadri speaking about 'Life in a German University' referred to sidelights in the character of the Germans, their extreme politeness, their thoroughness in work, their adaptability to circumstances and to their practical turn of mind.

Dr. Patel spoke of his experiences in Cornell University and referred to the powerful organization of students there, which maintained a well equipped and well run library of its own, and established besides contact between Old Boys and the University, by arranging periodical meetings and publishing bulletins. He also referred to the practice existing in Agricultural Schools wherein students were given their cows to maintain and were taught both the practical and the business side of dairying, every student having to attend himself not only to the manufacture of all dairy products but also to their disposal in the market; by such a system, it was not unusual, that many students were able to accumulate at the end of their course, enough money to start a small dairy concern of their own.

Athletic activities.—The Inter-class Tournament in cricket, football and hockey, for the Victory Cup, was rushed through during the month. The First Years were out of the picture from the beginning, proving easy victims to their seniors. The contest was between the Second and the Third Years; the former won easily in cricket, but they had to go all out to beat the latter in hockey by a narrow margin of one goal. As however, they had secured the maximum points necessary by these two wins, the football matches were not continued, and thus the Second Years won the coveted Victory Cup. The first year lads will pick up experience for the coming year, and the final year veterans must be serious at their studies to concentrate too much on games, and it is fitting that the Second Years carried the laurels.

The A. C. and R. I. American Sealed Handicap Tennis Tourney.—The Doubles Tournament which took a definite shape in 1928 has undergone some healthy modifications this year in the hands of our energetic Tennis Secretary and under the personal guidance of our present active Principal. The original Tourney run on the 'Knock Out' has been replaced by the more popular 'American Sealed Handicap' system and great interest has been evinced by the members and other students. Partnership was decided purely by ballot, by a special committee appointed for the purpose and the decision of the fateful handicaps will also be left to them. As many as 24 couples have competed for the covetable trophies which will be presented on the 'Tennis Day' to be held some time next session. The matches are in progress and it is still too early to say which pair will come out successful.

Visitors.—Dr. W. S. Shaw, Tea Scientific Officer, U. P. A. S. I., was here for about ten days during the month to consult literature in the Library. Mr. F. H. Butcher, Curator, Government Botanic Gardens and Parks, Ootacamund, was here on a visit on December 12.

Send-off to Rao Sahib Y. Ramachandra Rao.—On the eve of his departure to the distant North as Deputy Locust Entomologist, Rao Sahib Y. Ramachandra Rao, was met by the members of the Officers' Club at Tea. After refreshments the members adjourned to witness a jugglery performance, after which Mr. G. N. Rangaswami Ayyangar, Vice-President of the Club made a felicitous speech on behalf of those assembled, wishing success and health to the guest and Mr. Y. Ramachandra Rao suitably responded. The Rao Sahib was also entertained by the Executive of the M.A.S.U. wherein as a member of the Editorial Board, he has been rendering unstinted and solid service. He was given a send-off as well by his wards among the students of the College.

The Ladies' Club.—The Club Day was celebrated on December 20, with great enthusiasm as usual. A message from Mrs. Hilson wishing all success to the Club was read during the function, which was largely attended by many ladies of the Estate, members and non-members. The good work done by this Club in providing healthy recreation for the ladies of the Estate, is seriously hindered for want of a building and we understand that the members contemplate raising a Building Fund. Originally, under the able guidance of Mrs. Rama Reddy, the President and then under the fostering care of Mrs. Karunakar, the Vice-President, and with the energetic enthusiasm of Mrs. Cherian, the Secretary, the Club has recorded a year of great usefulness and we wish the members all success in their endeavours to get a building of their own.

THE LATE RAO SAHIB A. RAMA RAO.

We have to record with great sorrow the death of a distinguished old student of Saidapet, Rao Sahib Adurti Rama Rao, which sad event took place at Benares in October last. The son of a prominent vakil of Cuddapah, Mr. Rama Rao passed out of the College of Agriculture, Saidapet in 1889 and leasing out some lands in Godavari District—Neelapalle Farm—devoted his time and money to the reclamation of that land, which was largely alkaline, and settled down as a contented practical farmer. He also got himself trained in Dairy Farming under Mr. J. Mollison at the Kirkee Farm, Poona. On the invitation of Mr. H. C. Sampson, who was then the Agricultural Expert to the Court of Wards, Mr. Rama Rao accepted the post of Home Farm Superintendent of the Sivagiri Estate in the Tinnevelly District, which was at the time under the management of the Court of Wards. Quietly, slowly and unostentatiously he effected several improvements not only in the Home Farm but in the general agricultural practices of the Zamindary, with the result that its income came to be almost doubled ; and the zamindar had a great personal regard for him and kept him on after he assumed charge from the Court of Wards. He may be said to have been the first to have popularized *Kolinji* as a green manure. He was an unassuming but very successful propagandist. His work at Sivagiri attracted the attention of the Agricultural Department, with the result that his practical experiences came to be published as bulletins and leaflets of the Department. In appreciation of his services an offer of a First Grade Farm Managership was made to him, when he was past 45 years of age, and practically all the remaining years of his service were spent at the Manganallur Agricultural Station in the Tanjore District. Barring the pioneer work done by Mr. C. Narayana Ayyar at that station, the credit for all the successful results achieved at that Farm goes to Mr. Rama Rao. He was conferred the title of Rao Sahib in recognition of his services, prior to his retirement about ten years ago. He was a genuine friend and guide to all the Assistant Managers who worked under him and who in return had a warm affection for him. Having had the misfortune to lose his devoted wife when he was under 25 years of age, he lived an ascetic life and gave away practically all his property to charitable purposes. After retirement, he chose to make Benares his home, and spent the last years of his life in religious studies and spiritual contemplation at Manasarowar Ghat, bathing in the sacred Ganges and worshipping God Visveswara, whenever his health, which was always feeble, permitted him to do so. He settled at Benares with the sole object of ending his last days there—the cherished object of every devoted Hindu. May his soul rest in peace!

Departmental Notifications

Appointments Transfers, etc.

Second Circle.—V. Achyutham, A. A. D., Bapatla, L. A. P., for 10 days from 6-12-30.

Third Circle.—K. T. Bhandary, A. D., Hospet, L. A. P., for one day on 3-1-31 with permission to avail of Christmas and New Year holidays and Sunday the 4th January 1931. P. Nagadhara Naidu, A. A. D., Bellary, extension of L. A. P., already granted by two weeks. M. Satyanarayana, A. D., Cotton work, Nandyal, L. A. P., for 10 days from 3-1-31 with permission to prefix Christmas and New Year holidays and to affix the Pongal holidays.

Fourth Circle.—M. K. Swaminatha Ayyar, A. D., Wallajah, L. A. P., for 7 days from 27-11-30. Bhairy Siva Rao, A. D., Madanapalle, L. A. P., for 21 days from 15-12-30. S. Venkatarama Ayyar, A. D., Trivellore, on return from leave on 12-12-30 is transferred as A. D., Chidambaram. P. S. Venkatasubramanian, F. M., Kalahasti, on relief, will report himself at Cuddalore, for training in District work, directly under the orders of the District Agricultural Officer, Cuddalore, for 3 months. V. Kumaraswami, F. M., Palakuppam posted as A. D., Tiruttani. C. S. Seshagiri Ayyar, A. D., Vellore, L. A. P., for 1 month and 4 days from 20-11-30 with permission to suffix Christmas holidays. K. Varadachari, posted as A. D., Vellore. N. V. Kalyanasundaram, F. M., Kalahasti, leave without allowances for 30 days from 3-10-30. In supersession of a previous order, C. S. Seshagiri Ayyar, A. D., Vellore, L. A. P., for one month from 24-11-30 with permission to suffix Christmas holidays.

Fifth Circle.—K. Krishnan, A. D., Perambalur, L. A. P., for 9 days from 15-12-30 with permission to affix Christmas and New Year holidays. M. P. Gowrisankara Ayyar, A. D., Papanasam, L. A. P., for 7 days from 18-11-30.

Sixth Circle.—G. J. Balraj, A. A. D., Periyakulam, L. A. P., on medical certificate for 14 days from 2-12-30. C. S. Sankaranarayana Ayyar, A. D., Tirumangalam, L. A. P., for 4 days from 5-11-30.

Seventh Circle.—P. Abdulla Haji, A. A. D., Manantoddy, granted extension of L. A. P., for 22 days from 2-12-30 with permission to affix Christmas and New Year holidays. A. P. Balakrishnan Nayar, F. M., Pilicode, L. A. P., for 3 weeks in continuation of the Christmas and New Year holidays.

Eighth Circle.—P. S. Manian, A. D., Annur, L. A. P., for 7 days from 7-11-30. S. Ramaswami Ayyar, A. D., Palladam, L. A. P., for 18 days from 6-12-30, with permission to affix Christmas and New Year holidays. M. Subramania Pillai, A. D., Erode, granted extension of L. A. P., by 14 days in continuation of leave already granted to him, with permission to affix the Christmas and New Year holidays. K. M. Venkatachalam Pillai, A. A. D., Namakkal, L. A. P., for 15 days from 3-1-31 with permission to prefix the Christmas and New Year holidays.

G. A. C's. Section.—R. Kochukrishna Pillai, Assistant, L. A. P., for 1 month from 3-1-31, with permission to prefix the Christmas and New Year holidays. M. R. Balakrishnan, Assistant, L. A. P., for 15 days from 3-1-31, with permission to prefix the Christmas and New Year holidays.

G. M's. Section.—K. Achuthan Nambiar, Sub-Assistant, transferred from 24-11-30 to VII Circle for Palmyra disease work. S. Rajarathnam, Sub-Assistant, L. A. P., for 23 days from 1-12-30 with permission to affix the Christmas and New Year holidays. C. Krishnan Nayar, Assistant, L. A. P., for 3 months and 15 days from 3-1-31 with permission to avail the Christmas and New Year holidays.

G. E's. Section.—V. Margabandhu, Assistant, extension of L. A. P., for one week from 30-11-30. E. R. Gopala Menon, Assistant, L. A. P., for 8 days from 8-11-30. M. S. Subbiah, Assistant, L. A. P., for 1 month from 15-11-30. C. S. Balasubramaniam, Assistant, is posted to Kaity. E. R. Gopala Menon, Assistant, L. A. P., for 1½ months from 20-11-30. M. S. Subbiah, Assistant, L. A. P., for 4 days from 16-12-30, with permission to avail of the holidays on the 20th and 21st December 1930.

G. S. B's. Section.—K. Cherian Jacob, Assistant, L. A. P., for 23 days from 1-12-30, with permission to affix the Christmas and New Year holidays. J. David, Sub-Assistant, L. A. P., for 22 days from 2-12-30, with permission to affix the Christmas holidays.

Principal's Section.—M. Raman, F. M., L. A. P., for 28 days from 26-11-30. K. Gurumurthi, Assistant Lecturer in Dairying, L. A. P., for 20 days from 3-1-31, with

permission to prefix Christmas and New Year holidays. K. T. Benjamin, F. M., Live stock Research Station, Hosur, posted to officiate as Assistant Lecturer in Dairying.

D. D. L. S's. Section.—V. Karunakaran Nayar, F.M., Hosur, L. A. P., for 1 month from 6-12-30.

Paddy Specialist's Section.—K. B. Viswanadham, F. M., Maruter, L. A. P., for 1 month from 24-11-30, with permission to suffix Christmas holidays. S. Ramanujam, Assistant, Aduturai, L. A. P., for 7 days from 17-12-30, with permission to avail of the Christmas and New Year holidays.

M. S's. Section.—K. Narayana Nair, Assistant, is transferred to the Agricultural Section as Farm Manager, but will continue to work under the Millets Specialist. T. S. Seshu Kutty, B.A. (Hons.), appointed Assistant. The appointment of T. S. Seshu Kutty, as Assistant, is cancelled.

Cotton Specialist's Section.—V. Chidambaram Pillai, F. M., Koilpatti, L. A. P., for 10 days from 8-12-30. P. Gopalaratnam, Assistant, L. A. P., for 1 month from 10-12-30.

Curator's Section.—K. K. Hegde, A. F. M., Nanjanad, L. A. P., for 13 days from 18-12-30.

Gazette notifications.—The services of Mr. C. Narayana Ayyar, D. A. O., Cuddalore, have been placed at the disposal of the Co-operative Department. The services of Rao Sahib Y. Ramachandra Rao, Entomologist, Coimbatore, are placed at the disposal of the Imperial Council of Agricultural Research for appointment as Deputy Locust Entomologist. Dr. T. V. Ramakrishna Ayyar, Lecturer in Entomology, to be officiating Entomologist. Mr. M. C. Cherian, Assistant Entomologist, to be officiating Lecturer in Entomology. Mr. John A. Muliyil, Assistant in Entomology, Upper Subordinate, 1st Grade, to be Assistant Entomologist, temporarily for a period not exceeding three months.

Latest Notifications.—Mr. T. Murari, Superintendent, Livestock Research Station, Hosur, to be in charge of the duties of Deputy Director of Agriculture, Livestock, vice Mr. R. W. Littlewood, granted leave for 10 months. Mr. A. Gopalakrishna Iyah, Farm Manager, Livestock Research Station, will do the duties of the Superintendent, Livestock Research Station, vice Mr. T. Murari.

The orders regarding promotions in the Upper Subordinate cadre made in April, May, June and August 1930 are revised as follows :—

A. Science Section. From II to I Grade.—Mr. John A. Muliyal, with effect from 14-6-30. From III to II Grade.—Messrs. P. N. Krishna Ayyar and S. Kasinatha Ayyar from 1-4-30. Mr. C. V. Ramaswami Ayyar from 14-8-30. From V to IV Grade.—Messrs. C. V. Sundaram, B. S. Narasimha Ayyar, M. Rajagopala Ayyar, C. Vijayaraghavachari and C. M. John from 1-4-30.

B. Agricultural Section. From II to I Grade.—Messrs. M. K. Nambiyar and M. Arogiaswami Pillai from 1-4-30. Mr. C. V. Seshachari from 8-6-30. From III to II Grade.—Messrs. S. Narayana Ayya, V. G. Dhanakoti Raju, M. U. Vellodi, M. Veeraraghava Rao and P. Swami Rao from 1-4-30. Mr. Rajagopal G. Mal from 8-6-30. Mr. L. Narasimha Acharya, provisionally promoted from 8-6-30. From V to IV Grade.—Messrs. V. S. Ramaswami Ayyar and K. Ramanatha Ayyar from 1-4-30. [The promotions of Messrs. M. Raman and K. W. Chakrapani Marar from IV to III Grade will stand, but the promotions of Messrs. V. K. Subrahmanya Mudaliyar and T. G. Muttuswami Ayyar and S. R. Srinivasa Ayyangar from V to IV Grade are cancelled.]

First Circle.—Mr. S. Suryanarayana, Agricultural Demonstrator, Bobbili, L. A. P., for 4 days from 24th December, 1930, with permission to avail Christmas and New Year holidays. Mr. T. V. Krishnaswami Rao, Manager, Samalkota, L. A. P. for one week from 5-1-31 with permission to prefix Christmas and New Year holidays.

Third Circle.—Mr. K. Raghavachari, Farm Manager, Hagari, L. A. P., fot 13 days from 5-1-31, with permission to prefix Christmas and New Year holidays and to suffix Sunday 18-1-31. Mr. M. Damodara Prabhu, Probationary Farm Manager, Hagari, L. A. P., for 8 days from 5-1-31 with permission to prefix Christmas and New Year holidays and to affix Pongul holidays.

Sixth Circle.—Mr. G. Rajagopala Mal, Agricultural Demonstrator, Aruppukottai, L. A. P., for 4 months on medical certificate from 5-1-31, with permission to avail Christmas and New Year Holidays. Mr. C. S. Namasivayam Pillai, Assistant Agricultural Demonstrator, Rajapalayam, extension of leave on average pay on medical certificate for two months from 16-12-30. Mr. G. J. Balraj, extension of L. A. P., on medical certificate for one week from 16-12-30, with permission to suffix Christmas and New Year holidays.

APPENDIX

LIST OF BOOKS, BULLETINS AND OTHER PUBLICATIONS RECEIVED IN THE AGRICULTURAL COLLEGE LIBRARY DURING NOVEMBER 1930

A. BOOKS

1.	*Farmer's Hand-book*	By Synnott, K., 5th Edn....	1929
2.	*Pruning*	,, Savage, C., 9th Edn. ...	1930
3.	*Rusticus Loquitor or the old light and the new in the Punjab Village.*	,, Darling, M. L. ...	1930
4.	*The Development of Indian Agriculture.*	,, Howard, A. and Y. L.	1929
5.	*The Application of Science to crop production.*	,, ,, ...	1929
6.	*Poultry farming in N.S.W.* ...	,, Hadlington, J., 6th Edn.	1930
7.	*Co-operation and rural welfare in India.*	,, Mukerjee, B. B. ...	1929
8.	*An introduction to the scientific study of the soils.*	,, Comber, N. M. ...	...
9.	*Allen's Commercial organic analysis, Vol. III.*	,, Grant, C. M. ...	1929
10.	*Bibliographical monograph on plant genetics.*	,, Matsura, H. ...	1929
11.	*Game birds of India, Burma and Ceylon, Pheasants and Bustard quail, Vol. III.*	,, Baker, S. ...	1930
12.	*Outlines of Zoology*	,, Thompson, J. A., Revised.	1929
13.	*Notes on Lectures on Elementary applied Mechanics.*	,, Love, H. D. ...	1929
14.	*The principles of mechanics* ...	,, Plummer, H. C. ...	1929
15.	*Notes on Building Construction* ...	,, K. N. Ayyangar ...	1929
16.	*Notes on Building Materials* ...	,, ,, ...	1929
17.	*Barlow's tables of squares, cubes, square roots, etc.*	,, Combie, L. J. ...	1930
18.	*Indexing—A handbook of instruction.*	,, Brown, G. E. ...	1921
19.	*Cataloguing rules*	,, Fellows ...	1926
20.	*Practical handbook of modern cataloguing.*	,, Bishop, W. W. ...	1927
21.	*Decimal classification and index* ...	,, Dewey, M. ...	1927
22.	*Glossary of law terms*	,, Madras Government Publication.	1930
23.	*District Gazetteer, Bellary, Vol II* ...	,, ,, ,, ...	,,
24.	*Do. Ganjam, Vol. II* ...	,, ,, ,, ...	,,
25.	*Do. Cudappah, Vol. II* ...	,, ,, ,, ...	,,
26.	*British Pharmaceutical Code* ...	,, Pharmaceutical Association.	1923

B. REPORTS, PROCEEDINGS, Etc.

1.	Annual Report of the Madras Agricultural Department for 1929-30.		......
2.	Do.	Royal Botanic Gardens, Calcutta.	......
3.	Do.	Agricultural Department Punjab, Part II—Annual Record of Experimental work.	......

4.	Annual Report of the Agricultural Department Colony of Seychelles for 1929.	......
5.	Annual Report of the Agricultural Department British Guiana for 1929.	......
6.	Do. Gold Coast Colony for 1929–30.	......
7.	Do. Cyprus for 1929.	......
8.	Do. Stations, Central Circle, U.P. 1929–30.	......
9.	Do. Hill Circle, U.P. 1929–30.	......
10.	Do. (Research) East Malling, Kent, 1929.	......
11.	Do. Amani, East Africa 1929–30.	......
12.	Do. Cattle-breeding operations in C.P. and Berar 1928–29.	......
13.	Do. Civil Veterinary Department, Madras 1929–30.	......
14.	Agricultural Statistics of India, Vol. II, 1927–28 ...	......
15.	Proceedings of the Legislative Council, Madras, November 1930.	......
16.	Year Book of Agriculture, U.S.A., 1930 ...	......

C. MEMOIRS, BULLETINS AND PUBLICATIONS.

17.	Studies in soil colloids, Part III	*Pusa Chemical Series, Vol. XI, No.* 6
18.	Do. Part IV	,, ,, ,, 7
19.	Do. Part V	,, ,, ,, 8
20.	Studies in Indian oil seeds (The types of Sesamum Indicum).	*Botanical Series, Vol. XVIII, No.* 5
21.	The grain shedding character in Rice plants and its Importance.	*Pusa Bulletin, No.* 205
22.	The arrangement of field experiments and the statistical reduction of the results.	*I.A.B. Soil Science Technical Communication No.* 10
23.	Subterranean clover	*Australia Agricultural Department Bulletin No.* 240
24.	The World position of wheat	*Australia Agricultural Department Bulletin No.* 241
25.	Pasture work and management	,, ,, 242
26.	Results of Experimental tests for the control of Codlin moth.	,, ,, 243
27.	Some popular Farming fallacies ... ... i. Blighting of wheat crops by superphosphate. ii. Telegony. iii. Intra-uterine influences. iv. Change of seed. v. Oats better than barley as a live-stock food. vi. Weevil develop spontaneously. vii. Stage at which oats should be cut for hay.	,, ,, 244
28	Method of harvesting grain sorghums ...	*U.S.A. Technical Bulletin No.* 121
29.	Spacing and date of seeding experiments with grain sorghums.	,, ,, 131
30.	Inheritance of composition of Washington Navel oranges propagated as bud variants.	,, ,, 163

31.	Breeding tobacco for resistance to Thiolavia Root rot.	*U.S.A. Technical Bulletin No.* 175
32.	The Citrus rust mite and its control	,, ,, 176
33.	Life history and habits of the Plum curculio in the Georgia Peach belt.	,, ,, 188
34.	Ever bearing strawberries	*Farmer's Bulletin No.* 901
35.	Cattle fever ticks and methods of eradication ...	,, ,, 1057
36.	Green house tomatoes	,, ,, 1431
37.	Protection of buildings and farm property from lightning.	,, ,, 1512
38.	Broom corn	,, ,, 1631
39.	Karakul sheep	,, ,, 1632
40.	Window curtaining	,, ,, 1633
41.	Surface irrigation in the Eastern states ...	,, ,, 1635
42.	Farm bulk storage for small grains	,, ,, 1636
43.	Flue curing of tobacco	*Union of South Africa Bulletin No.* 88
44.	Game laws for 1930–31	*Farmers' Bulletin No.* 1647
45.	New methods for the control of codling moth ...	*Union of South Africa Bulletin No.* 90
46.	Anatomy and physiology of the Digestive tract of the Japanese beetle.	*Reprint from the Journal of Agricultural Research Vol. XLI, No.* 3.
47.	The effect of hydrogen on concentration of the toxicity of nicotine, Pyridine and Methylpyrolidine to mosquito larvæ.	*Reprint from the Journal Agricultural Research Vol. XLI, No.* 4

D. LEAFLETS, CIRCULARS, Etc.

48.	Profits from Farm woods	*U.S.A. Miscellaneous Publication No.* 87
49.	Vitamins in Food materials	*U.S.A. Circular No.* 84
50.	Parasitism of the Mediterranean Fruit Fly in Hawaii 1922–24.	,, ,, 109
51.	Planting of trees by ryots on Poramboke lands not available for assignment under the Dharkast rules.	*Madras Leaflet No.* 73
52.	Construction and packing of an egg case ...	*U.S.A. Leaflet No.* 64
53.	Beef grading and stamping service	,, ,, 67

Everything for the Farm and Dairy

Implements and Utensils for all Purposes:

Ploughs
Reapers
Ensilage Cutters
Seed Grading and Dusting Machines
Tattooing Forceps
Castrators
Byre Fittings
Etc.

'Clock' Cream Separators
Butter Churns
Butter Workers
Milk Bottles
Milk Cans
Dairy Equipment of every Description
Etc.

Complete Dairy Schemes Prepared and Plant Erected anywhere in India

The Indian General Trading Co., Ltd.

[Sole Agents: Dairy Supply Co., London] **GOA STREET - BOMBAY -**

Crescent ICI Brand

'NICIFOS'

(Ammonium Phosphate)

The Ideal Modern Compound Fertiliser for India

TWO GRADES:

No. 1 'NICIFOS' 17/45 (17% Ammonia, 45% Phosphoric Acid)
No. 2 'NICIFOS' 22/18 (22% Ammonia, 18% Phosphoric Acid)

'NICIFOS'

1. Two plant foods in one.
2. No useless carrier.
3. Saves freight, handling and application charges.
4. No useless residue left in the soil.
5. Does not wash out of the soil; stays where you put it.
6. Better and more uniform than any mechanical mixture can be.
7. Easy and clean to handle, dry, white and crystalline.
8. Does not become moist or deteriorate in storage.
9. No acid: cannot rot the bags.
10. Specially suitable for TEA.

IMPERIAL CHEMICAL INDUSTRIES
(INDIA), LTD.
— Madras, Cochin and Calicut. —

THE STANDARD FURNITURE Co., Ltd.

KALLAI (S. MALABAR)

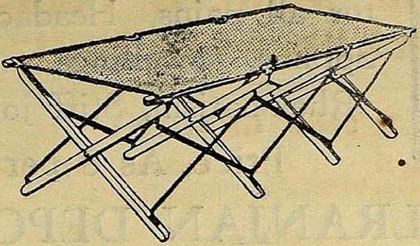
Largest Manufacturers of Camp Cots in India

OUR MOTTO:—Honest service and Moderate rates.
Maximum strength and Minimum cost.

OUR AIM:—To reduce cost, with the aid of modern appliances and serve the public in a real Swadeshi spirit.

We specialize in the manufacture of camp cots and have patterns to suit all pockets

Pattern A
'Excellence'



Price
Rs. 15 only

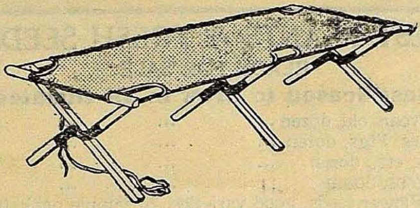
Mosquito rods
Re. 1

Bag **Rs. 1-8 only**

Cot with Water-proof canvas
Rs. 2 extra

The letters of appreciation we receive from our growing customers, bear testimony to the appropriateness of the name of this pattern. The cot is 6′ 3″ long and 2′ 4″ wide.

Pattern B
'Challenge'



Price
Rs. 13 only

Mosquito rods
Re. 1

Bag **Rs. 1-8 only**

The Challenge implied in this pattern is that with the aid of mechanical advantages, India can compete with foreign countries. Trial order will convince you that we have not exaggerated India's claims. The cot is 6′ 3″ long and 2′ 4″ wide.

Pattern C
'Marvel'

Price
Rs. 6 only

It is really a marvel that a folding canvas cot strong and durable is made available at this reduced rate. The cot is 6′ long and 2′ 4″ wide and fitted with Jute Canvas.

SPECIAL DISCOUNTS TO STUDENTS

We undertake to make specially on order—

Canvas Cots 7 ft. long and 3 ft. wide at Rs. 25 each

USE

DILRANJAN

Best Indian Pain Balm, Superior Balm in the Market, Magic cure for all pains, Headache, Cold, Sprains, Swellings, Neuralgia, Rheumatism, Stiff joints etc.

Price, As 8 per tin

DILRANJAN DEPOT

POST BOX 183, MADRAS

BEST PLANTS & FRESH SEEDS

READY FOR SALE

Best Season to Grow in all climates

	Rs	A
Salem Mango grafts, 3 years old, dozen	9	0
Guava and Pomegranates, Figs, dozen	6	0
Pomaloe, Orange, Limes, etc., dozen	9	0
Roses and coloured Crotons, dozen	6	4
English Vegetable and Flower seeds, good varieties, 20 sample packets, each set ...	2	0
Do do 10 sample packets, each set	1	0
Indian Vegetable seeds, 20 packets	2	0

Other sorts of plants and seeds are ready now.

Illustrated Catalogue free

S. K. I. ABDUL RAHIMAN SAHIB
Salem Nursery Gardens,
SALEM

Telegraphic Address 'NURSERY,' SALEM

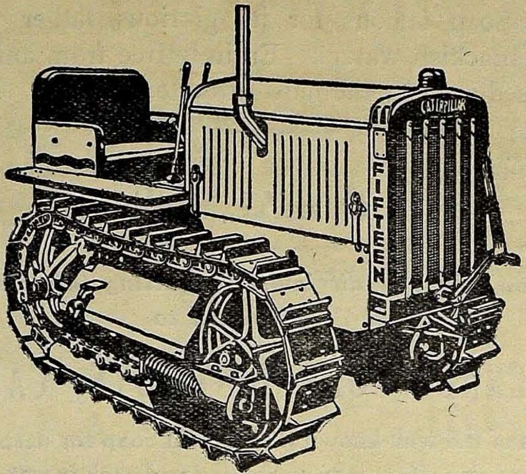
PLANTS FOR SALE

A revised catalogue of fruit trees and ornamental plants for sale at the Government Gardens, the Nilgiris, is now available and will be sent on receipt of annas four.

*Apply to :—*CURATOR,
Government Botanic Gardens, Ootacamund.

TO LET

CATERPILLAR



A Caterpillar Fifteen with a 3 furrow 42" Moldboard Plow in Medium Black Cotton Soil plowed 6½ acres 8" deep in 7 hours. All in cost

Rs. 4-8 per acre.

For Information on Reducing Costs and Improving Crops

Write to:

WILLIAM JACKS & CO.

P. O. BOX 1282, MADRAS.

CATERPILLAR

VEGETOL SOAP

The Soap famous for its glorious lather even in hard and brackish waters. Entirely free from animal fat. Can be used even by the most orthodox priest.

Agent for Coimbatore :—

R. C. DALAL, Calicut.

If you find any difficulty in getting this soap, please drop a card to

THE KERALA SOAP INSTITUTE, CALICUT

(Makers of the well-known Insecticidal Soap for destroying green bug on coffee, mango hopper and such insect pests).

THE GOLDEN JUBILEE

number of

THE MADRAS AGRICULTURAL JOURNAL

Royal 8vo. 68 pages

A valuable book containing a retrospect of Agricultural Education in Madras from 1876–1926 besides many interesting features including 18 full page photographs neatly printed on Art paper.

Original price	...	...	Re. 1-8-0
Now reduced to	...	...	Re. 0-12-0

(*will be sent post free on receipt of stamps worth 13 as.*)

Apply : Manager, MADRAS AGRICULTURAL JOURNAL,
Agricultural College, Coimbatore,
LAWLEY ROAD, P.O.

DO YOU GROW VEGETABLES & FLOWERS ?

THEN

LET US HELP YOU.

WITH BEST RELIABLE SEEDS.

(*CATALOGUE SENT FREE ON REQUEST.*)

THE GUJARAT SEED STORES, Seed Merchants,
SALOORE BAZAR, NADIAD (GUJARAT).
Telegrams :— 'SEEDSMEN, NADIAD.'

The Villagers' Calendar

Published Annually

BY

THE MADRAS AGRICULTURAL DEPARTMENT

IN

English, Tamil, Telugu, Malayalam and Kanarese

(*Jan.*) (*April*) (*March*) (*Sept.*) (*March*)

It contains instructive and interesting articles on Agriculture and Veterinary Science and exhaustively deals with the work of the department including agricultural research stations, pumping and boring operations, state loans &c.

Price 1 anna, Postage 2 annas

Apply to the Deputy Director of Agriculture or the District Agricultural Officer or the Agricultural Demonstrator nearest to you with three annas stamps. *Not sent by V. P. P.*

The Journal of the

Mysore Agricultural and Experimental Union

BANGALORE

Published Quarterly by an Expert Board of Editors

Chief Editor: DR. B. NARASIMHA IYENGAR, B.A., PH.D.

Subscription, Rs 3 per annum

The Madras Journal of Co-operation

The Premier Monthly Co-operative Journal in India
Voices forth the Co-operative Opinion of the Province

Annual Subscription

Inland (including Postage)	...	Rs. 4 0
Foreign ,, ,,	...	,, 4 12

Please apply to: The Madras Provincial Co-operative Union,
Royapettah, Madras.

The Madras Agricultural Journal

A Monthly Journal in English devoted to the study and development of Agricultural Science. Contains articles of scientific as well as of general interest written in popular language. Reviews of agricultural publications and extracts from various Journals—both Indian and Foreign—a special feature. Commands a wide circulation and an excellent medium, therefore, for advertisements.

Rates of Subscription

Journal supplied *free* to Members, New Associates and Patrons of the Union.

Annual Subscription rates for others :

	Rs	A	P
India and Ceylon.	4	0	0
Foreign ...	4	8	0
Single number	0	6	0

Rates of Advertisement

For single insertion	Rs	A	P
For full page ...	5	0	0
For half page ...	3	0	0
For quarter page ...	2	0	0

Discounts of 12½ per cent, 20 per cent and 33⅓ per cent will be allowed for 3, 6 and 12. Consecutive insertions of standing matter, provided space is booked ahead and prepayment made.

Inside cover pages 50 per cent extra.
Outside cover pages 75 per cent extra.

Preparation of blocks, unless supplied by advertisers, charged extra.

N. B.—All advertisements are subject to the approval of the M. A. S. U. Managing Committee before insertion. The charges are strictly *payable in advance.*

Contributions to Journal

Contributions on subjects of agricultural interest or pertaining to rural economy and co-operation will be accepted for publication, subject to approval of the Editorial Board. Correspondence and queries on agricultural and allied subjects are invited. Manuscripts should be sent clearly written or typed on *one side of the paper* only. Contributions should be addressed to *The Editor, Madras Agricultural Journal, Lawley Road P.O., S. India.*

Twenty five copies of reprints of contributions will be presented to authors. *Extra copies and Printed covers for reprints,* if required, can be supplied at actual cost if intimation is given when the manuscript is presented.

N.B.—The Editor does not hold himself responsible for the opinions expressed by the contributors.

Business communications should be addressed to :

THE MANAGER, M. A. S. UNION, AGRICULTURAL COLLEGE, COIMBATORE, LAWLEY ROAD P. O.

PRINTED AT THE DIOCESAN PRESS, MADRAS—C638